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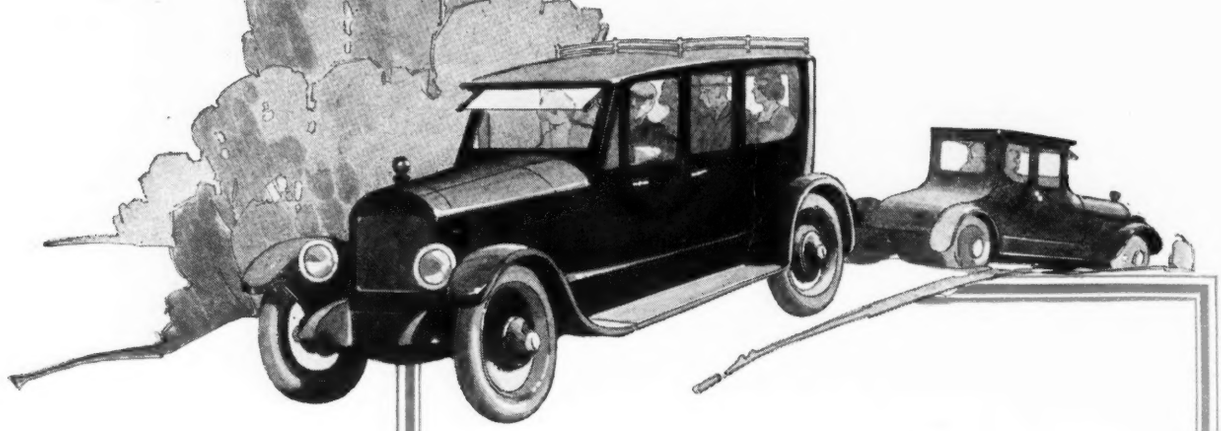

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLIV. NEW YORK—THURSDAY, JUNE 30, 1921 No. 26

Industry's Present Opportunity for Public Service

We recently have had lessons in what government can cost. Now the demand is for a more economical and a more efficient government. This can come about only as economy and efficiency are put into government by those who know how.

By Clyde Jennings

DURING the war the automotive industry sent many men to Washington and into similar public service because they were needed.

It was this public service on the part of the men of the industry that has gained for the industry, since the war, an instant hearing when it has asked opportunity to present its side of any controversy.

Now comes an opportunity for a similar service. The present crisis is not, perhaps, as acute as the former opportunity. Then men were needed to avert the calamity of violence that threatened from the other side of the world. Public service then was self-preservation for our institutions and our country.

At this time the opportunity for public service is chiefly to hasten the period when American business will come back to its own; to dislodge the bureaucracy that has become more strongly enthroned in our Government during the war; to put our Government on a modern business basis, compatible with the change that has been brought about in business during the last decade; to assist Congress in resisting those who have little respect for the greatest benefit of the public; to end the period of public extravagance; to carry out the tax program suggested by the National Automobile Chamber of Commerce and practically adopted by the administration.

The meat of the N. A. C. C. tax suggestion was contained in this one sentence that stood at the head of its program:

"Reduce ordinary expenses from war standards to sane, normal standard at once."

The Chamber of Commerce of the United States had for a slogan at its annual meeting:

More Business in Government.
Less Government (management) in Business.

To which Herbert Hoover added this line:

Better Government assistance in business.

A proper response of the chamber would have been:

Better Business Assistance to Government.

The present administration is working to this end, and this offers the present opportunity for public service. Very prominent in the program are two points, and both of these must have co-operation from business if benefit is to be gained. Here are the two most prominent:

The Budget Commission.
The new Department of Commerce.

The appointment of Maj. Gen. Charles G. Dawes, the Chicago banker and once Comptroller of Currency, as Director of the Budget is evidence that the

administration is in earnest in this economy move. General Dawes has performed two admirable feats of public service for the Harding administration, hence the appointment. He it was who went to Washington and was outspoken in defense of the earnest men who made some mistakes but did the best they knew to win the war. His outspokenness in this cause brought cheer to every dollar-a-year man who was threatened with a technical inquiry into his acts.

Hardly had the air been cleared from his lurid testimony on this subject when he was called back to conduct an inquiry into the mistreatment of invalid soldiers. This was supposed to be a six months' job. But Dawes surprised the country by granting that mistakes had been made, and in two days he had drawn a report of a reasonable system of management of this work and going home, putting the entire situation up to those whose responsibility it is to carry out this work.

Now this same Dawes is called back to inquire into the methods and systems of the Government and see if they are economical and efficient. He says this is a big task and that he must have much more assistance than can be employed with the money Congress has placed at his disposal. He proposes to work fast and to bring about such changes as may be wise or necessary within six months. He says that government is a big business, and the only men competent to adjust a big business enterprise are men who have had experience in big business. So he proposes to call to Washington many big business men who will be placed in the departments there to see if these departments, bureaus or whatnot are efficient from a business standpoint.

To answer such a call will doubtless disturb many a business man's plans. But government is much like a trade association: In the main you get out of it only in proportion as you put into it. Business men with one accord are saying that our Government is not efficient. They have demanded changes. Dawes is going to say to them:

You have been uttering destructive criticism, now we ask you for constructive assistance.

If business does not answer the Dawes call, it will never again be able to ask with reason for an adjustment of government to a new basis.

The response of the automotive industry and other industries that are crying out against high taxes will be the measure of the answer to that call.

The need for public service is very great in this crisis. The administration has neatly put industry on the defensive. We have faith that industry will not fail.

The New Department of Commerce

It has long been an axiom that a trade association benefited the member only in relation to what he puts into it.

The same is true of government. Secretary Hoover is offering to industry a very great opportunity to put much into government and in return draw much out of it. Hoover's connection with the engineering service, world adjustment of supplies and similar big enterprises are too well known to need comment here. His last public service before entering the Department of Commerce was at the head of the Survey for the Elimination of Waste. This movement is doubtless familiar to most industrial leaders, although the results have not as yet been made public in a definite form.

It is evident that in assuming his duties as Secretary of Commerce, Hoover carried with him many of his ideas on industrial waste. His present effort is to make this country a more efficient industrial unit, and to this end he is lending his assistance toward making government more efficient and to making industry more efficient.

It is Hoover's idea that business needs some sign-posts and traffic regulations, so that the movement of business can be more uniform and some of the sudden bursts of speed that serve only to exhaust the particular industry can be eliminated.

Business, as Hoover views it, is an interdependent structure. It has the common purpose of serving the population of the world well, or it cannot be at its best. Waste, be it in materials, idleness of plant or employee, is a handicap on everything in the world. Waste in any part of the world is important to all business.

The automotive industry cannot flourish without assistance from other industries, according to the Hoover view, and in turn the automotive industry greatly aids all other industries. This is true not only in actual turnover of business, but in the information that the industry may have gathered from its own peculiar field.

Industry needs to become better acquainted, so that it may better appreciate its interdependence and better help itself as a whole. It needs to better balance its production with sales prospects, and sales prospects depend entirely upon buying power. Buying power is at its best only when all industry is going with a considerable degree of efficiency. Each industry is too inclined to "go it alone."

This condition can be greatly remedied by acquaintance and a mutual program. Hoover sees in the ideal Government Bureau of Commerce just such an agency, and he is working toward this end with the material that he can avail himself of. His present efforts are chiefly toward a gathering of the material that will serve as sign-posts and, when properly appreciated, as traffic regulations. The over- or under-production is at present probably the greatest waste in industry. That probably is why the first step has been taken toward a gathering of industrial activities to present a complete picture of index of business.

This accomplished, the other points of the program will become workable. Too few of us appreciate standardization in the big way. The first idea always is that all automobiles or stockings are to be made by the same pattern and of the same material. Secretary Hoover in his vision of possibilities sees a much larger meaning for standardization. It has not been harmful to the hosiery business that stockings have been standardized as to size, so that one firm's size 9 was the same as another firm's size 9. It has been helpful. The standardization that has been accomplished within the automotive industry has been helpful and it may be possible that this standardization can be carried on between industries in many particulars for better production.

A very great waste exists to-day because of idleness of plant equipment. It is entirely possible that, with better equipment, those industries that are seasonal can be brought to the aid of other seasonal industries, and a steadier use of equipment and employment brought about.

It is entirely obvious, of course, that a government survey of buying power in a foreign country can be made available to all industries much cheaper than a similar survey by each unit in each industry. Such a survey would indicate whether there was necessity for a survey of a particular unit for its own needs.

Secretary Hoover is going to ask much of industry. It will be a public service to join his efforts, and to assist him in making his plan efficient and equitable.

If we can join these efforts to make our Government efficient and helpful, we will get that much more out of it. If industry puts more into government, it will matter much less what government costs.

Analysis of the Recent Horse-Tractor Work Cost Report

It appears to be extremely difficult to get down to actual facts on what it costs to do work on the farm with a tractor. A recent comparison of horse and tractor cost comes nearer the point than many previous reports.

By David Beecroft

MANY misleading bits of information on what a tractor can do on the farm and how it compares in capacity for work and cost of work are partly corrected in a preliminary report on an investigation of tractor and horse work on 286 farms in Ohio, Indiana and Illinois, conducted by the Bureau of Farm Management and Economics of the Department of Agriculture, the investigations being made by a series of investigators who visited these 286 farms in the latter part of 1920. The Department of Agriculture was assisted in the work by a horse association known as the Bureau of Animal Industry and as such was sponsored by a horse organization rather than by tractor manufacturers. Having originated under what might be designated as horse auspices it can scarcely be considered favorably to tractor farming, but yet the result is generally highly complimentary to the tractor.

During the year covered by the investigation on the 286 farms on which horses and tractors were used, the report shows that the cost of farming by tractor was no greater than the cost by horses. This really means a cheaper cost for tractors, for as the preliminary report of the Department of Agriculture says, "any saving in man labor costs, any gain due to getting a larger amount of work done in a given time, and any other advantage connected with the use of tractors, which cannot be measured directly in dollars and cents, might be considered clear profit."

It has always been considered that a good way for a farmer to get advantages of the tractor on farming is the conservation of man power due to the short time in which a tractor will accomplish a given unit of work, as compared with the time needed by horses. Still another tractor advantage of importance, has been the ability to do the farm work when it best can be done and the greater crop yield due to this, as compared with the longer time needed by the horse. Big tractor farmers have always advanced this as the strongest reason for the tractor. This has appealed to them more than the cost per acre to do the work by tractors as compared with horses.

The government report shows that on the 286 farms using tractors, the tractor does the work of 2.1 horses on an average throughout the year. On these farms the tractors averaged only 30.8 full days' work per year; but the old tradition that the horse works 300 days in the year on the farm was exploded. The horses on these 286 farms averaged 68.6 full days' work per year. The horse is far from working 300 days per year. There is not work for him all the time and if there were he could not stand it the year round.

The report shows that in 1920 the cost of plowing by horse was higher per acre than by tractor. Here are the figures:

Plowing cost per acre, 2-plow tractor	$2.20
Plowing cost per acre, 3-plow tractor	2.20
Plowing cost per acre, horses	2.90

Here the report adds that in 1921 with reduced cost of horse feed the cost per acre of plowing by horses would be $1.90, adding that to the cost of farming by horses has reduced much more in the past year than the cost of farming by tractor. The report makes an effort to show what reduction in cost has been made by tractors due to reduced tractor prices and lower fuel prices.

In such other farm operations as disking and grain cutting the costs by tractor and horse are remarkably close. Here they are:

Disking, tractor, cost per acre	$0.67
Disking, horse, cost per acre	0.64
Grain cutting, tractor, cost per acre	0.67
Grain cutting, horse, cost per acre	0.59

Some light on the cost of keeping horses per year is shed by the report which states that on the 286 farms the average cost of keeping a horse per year is $159. This cost includes charge for feed, shoeing, veterinary, housing, interest at 6 per cent on investment and depreciation. It also gives the horse a credit of $15 per year for manure. The feed for the horse averaged $134 per year alone. Again the report apparently endeavoring to favor the horse estimates that based on March, 1921, prices the cost of feed per horse for 1 year would be about $80, but no deduction as to reduced tractor cost has been made. The average farm cost for horse labor per year on the 286 farms was $1,076. The cost of a horse per day is $2.43 for each day it works based on 68.6 days' work per year.

Some side lights on the long mooted question as to whether a farmer can sell some of his horses when he purchases a tractor are given in the report from the 286 farms. On 172 of the farms there was a reduction of 2.2 horses per farm. A still further analysis of these 172 farms reveals the following:

Farmers who did not reduce horses	44
Farmers who reduced by 1 or 2 horses	62
Farmers who reduced by 3 or 4 horses	43
Farmers who reduced over 4 horses	23

This is a definite answer to the question and the fact that a horse averages only 68.6 days' work per year on the 286 farms leads to the conviction that quite a few more horses could be disposed of if the farmer analyzed the situation as carefully as he might. Before these 286 farmers purchased tractors they had 1 horse to every 27.6 acres and after they had tractors they averaged 1

horse to every 37.9 acres. That there is a very great surplus of work horses on the average farm is plain by the fact that on 143 of the 286 farms all of the horses were not used for any one operation on the farm, there was always a reserve of horses.

Some useful cost figures on tractor operation are covered in the report. The 286 farmers estimated the life of the tractor at 6.7 years. To operate a two-plow tractor per day costs $12.65, and a three-plow tractor $17.75.

In fuel consumption while the kind of fuel used is not given in the report quantities are, and for different farm work the fuel consumption per day is:

Plowing 2-plow tractors	18 gallons
Plowing 3-plow tractors	23 gallons
Hay-loading, 2-plow tractors	11 gallons
Hay-loading, 3-plow tractors	15 gallons
Fuel per acre for plowing 2-plow tractor	2.8 gallons
Fuel per acre for plowing 3-plow tractor	2.7 gallons

The capacity of these tractors per day for different works are as follows:

Plowing 2-plow tractor	6.6 acres
Plowing 3-plow tractor	8.6 acres

The measure of work done by the tractors on the 286 farms covered in the report varied according to the kind of work, naturally the hardest job plowing being largely done by the tractor. Average percentages for all farms:

Plowing (by tractor)	85 per cent
Disking (by tractor)	73 per cent
Harrowing, etc.	43 per cent
Grain cutting	41 per cent
Haying	15 per cent

The volume of tractor sales in a given territory is highly dependent on the acreage of farms in the territory, and the type of tractor is also influenced by this fact. Here are the figures:

2-plow tractors	174 farms
3-plow tractors	104 farms
1-plow tractors	1 farm
4-plow tractors	6 farms
5-plow tractors	1 farm
Total	286 farms

The 286 farms averaged 258 acres, which is larger than the average of farms in these three States and the two-plow tractor was used on 75 per cent of farms under 160 acres and on 53 per cent of farms 160 acres or over.

The tractors were not all new, several having been used over three years and others as follows:

One year or over	106 tractors
One and one-half or two years	100 tractors
Two and one-half or three years	49 tractors
Over three years	31 tractors
Total	286 tractors

With these figures in mind the repair cost per year may be considered. The repair cost per year on the two-plow tractor was $39 and was the same on the three-plow tractor. The two-plow and three-plow tractors were out of commission only two days per year on the average when they were needed. Annual depreciation of the two-plow tractor is put at $164 and on the three-plow tractor $217.

It is questionable if tractors on these farms are used as much as they might be. There is always considerable belt work for tractors, but the report shows them used very little for such. The big job is what is called drawbar work, that is, pulling some implement, such as plow, disk, self-binder, hay-loader, etc. Here is an analysis showing averages on the 286 farms:

Drawbar work	23.5 days
Belt work	2.7 days
Custom work	4.6 days
Total	30.8 days

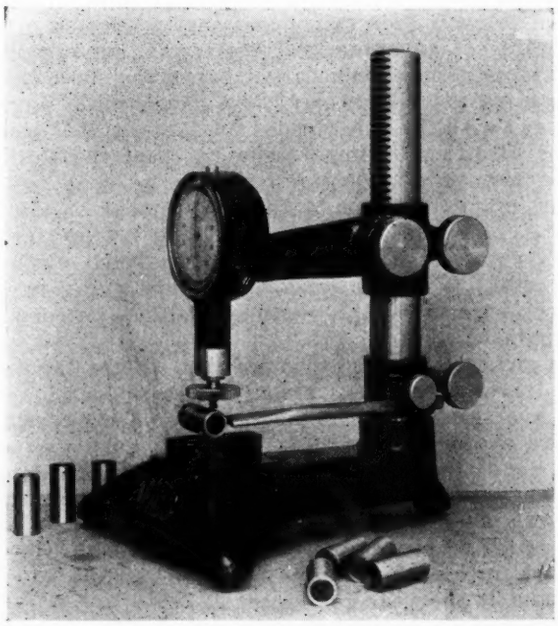
The report contains a few very useful observations on the possibility of farmers reducing cost of doing work by horses and also by tractors. It says: "Repair costs and fuel consumption of the tractors could in many cases have been reduced. The fact that on 20 of the 286 farms the work horses did less than 40 days' work per head per year indicates that on some farms there are still more work stock than needed."

A New Dial Comparator

THE Ames dial comparator, a new instrument herewith illustrated, is intended for use in the shop on production as well as in the inspection department. All parts of the instrument are protected from dust and all bearing surfaces are hardened and ground. The gage is designed for use on bushings, pins, shafts, plates and similar parts. Its advantage over the micrometer is that the personal element is eliminated, the operation of gaging being controlled by a spring. The dial is 1⅞ in. in diameter, giving 0.00005-in. readings direct as 1/16-in. on the dial, thereby enabling readings of .00025 in. to be made with ease.

In using the gage the clamp is loosened and the arm supporting the dial is raised or lowered by the knurled nut until the contact point touches the work or standard. The clamp is then tightened and the hand of the gage brought to 0 by turning the adjusting screw above it right or left. The gage has a travel of ¼ in., so that when set to a 0.500 in. standard it will measure from 0.500 in. to 0.750 in., making it handy on shafts, bushings, etc., of more than one diameter.

A stop is furnished for revolving work against, for out of roundness, etc. The gage is furnished with two hardened and ground anvils, ½ x 2 in. and 2 x 2-in. scored. It stands 10½ in. high and weighs 10 lbs.



The Ames Dial Comparator

An American Built Light Car

Designed along European lines for production in this country. Chassis has 100 in. wheel base, 50 in. tread, and weighs only 850 lbs. Adjustable steering gear and propeller shaft brake among the novel features.

By Herbert Chase

ADMIRERS of British and other European light cars have often expressed the hope that a car of similar design and proportions would be built in this country. Some efforts in that direction have indeed been made but have either failed or the design has been modified to meet the demands of the American public or other domestic factors, notably the competition of cars produced in quantity at a lower price. The Moller Motor Co. is attacking the problem from another angle by the production by American methods of a light car intended not primarily for domestic, but for European consumption. Cars will be marketed in this country, but the present intention is to export the bulk of the cars produced, and not to produce large quantities, probably about 300 chassis the first year.

The chassis, illustrated herewith, has a 100 in. wheelbase, 50 in. tread and weighs only 850 lb. The total weight with two seater body is said to be approximately 1100 lb. The engine has four cylinders of 2¾ in. bore cast in block with detachable L-head. The stroke is 4 in. The crankshaft has three white metal bearings. The front bearing is 2 in., center bearing 1¼ in. and rear bearing 2¾ in. long. The camshaft is also carried in three bearings. It is driven by Whitney chain and an idler is provided to take up the slack in the chain, this adjustment being made by turning a locknut and set screw projecting through the crankcase. The valves have cast iron heads 1⅜ in. o.d. welded to carbon steel stems. Connecting rods are drop-forged from .40 carbon steel. Lynite pistons with two hammered piston rings are employed. Both halves of the crankcase are of aluminum.

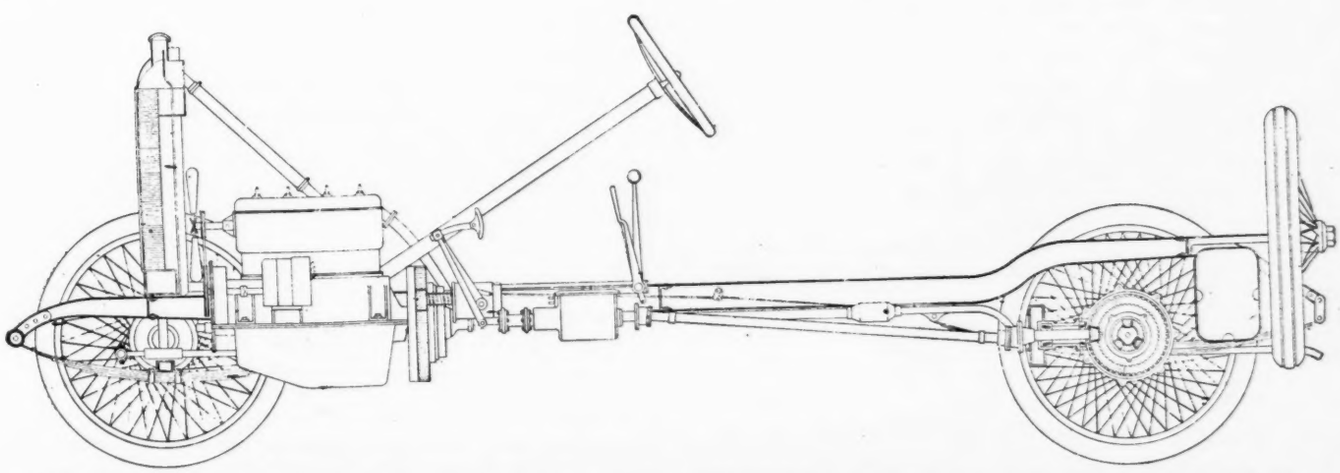
The engine is designed for high speed operation and is carefully balanced. It is said to be capable of speeds as high as 4000 r.p.m. It develops 20 hp. at 3000 r.p.m., at which speed it will, according to the manufacturers, drive the car at 60 m.p.h. with 4 to 1 gear ratio and 27 in. wheels.

Lubrication is by splash, the pump being bolted to the front plate of the distribution case, where it is readily accessible. Thermosyphon cooling is employed and the fan is belt driven. An attractive and distinctive honeycomb radiator with aluminum shell is fitted. Ignition is by Eisemann magneto. Bosch starting and lighting units are employed. These are carried on the subframe in which the engine and transmission are mounted and are located just forward of the gearbox. The generator is driven by a spring belt, and the starting motor is fitted with Bendix drive.

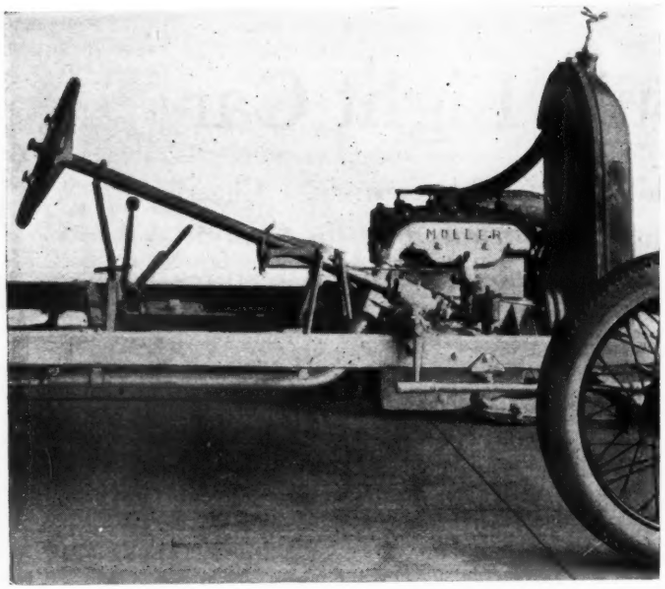
The clutch is of the multiple disk type. It has two driven plates and is enclosed by an aluminum case bolted to the flywheel. The gearbox is located amidship, following European practice, and is connected to the clutch by a shaft with two fabric disk joints. Gearbox and cover are of aluminum. The controls with *H* gate are located centrally above and just to the rear of the box. Three speeds are provided, the total reduction on low being 12 to 1 and on intermediate 8.68 to 1. The drive shaft is equipped with the smallest size of Spicer universal joints at each end. Hotchkiss drive is employed.

The final drive is by straight bevel gear to the semi-floating type of rear axle. The housing of the latter is of malleable iron. An interesting feature is the propeller shaft brake located on the axle just aft of the rear universal. This mounting gives the advantages of the transmission brake without transmitting the breaking stresses through the universals and propeller shaft. This brake is of the internal expanding type and is foot operated. The hand brake is also of the expanding type and is located on the rear wheels according to conventional practice.

The front axle is built up of square section seamless steel tube. The spindle yokes are welded into the ends of the tube, care being taken to secure an air tight joint so that water is excluded and corrosion prevented.



Side and part sectional view of the Moller light car chassis. Note location of foot brake on axle just aft of rear universal

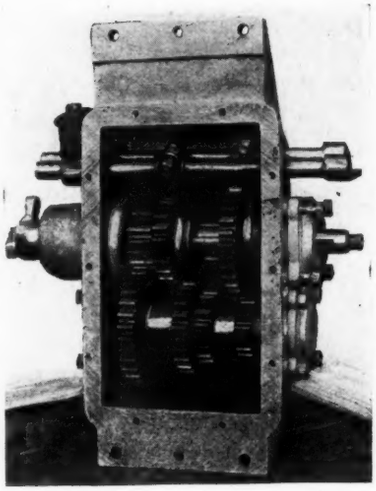


Forward end of Moller chassis, showing adjustable steering gear and combined inlet and exhaust manifold.

Great care has been exercised in designing the spring suspension since the designers are convinced that the failure of many light cars has been brought about by failure to realize the importance, not only of easy riding, but of protecting the chassis parts from road shock and excessive stresses resulting from failure to provide proper springing. The entire chassis can be lifted by two men and the spring action is so soft that considerable deflections of the springs result from a rocking motion easily imparted to the chassis frame by one hand. The car is also easy running. It can be readily moved by grasping the propeller shaft in the hand and imparting to it a turning effort. All the springs are semi-elliptic. Those in front are 31 in. long and the rear pair 40 in. long. The leaves are tapered, being thinner at their outer ends, and made of silico-vanadium steel. Lubrication of chassis parts is provided by 21 Alemite connections where necessary.

The frame is of ⅛ in. pressed steel and has a 4 in. kick-up at the rear end. Three hot riveted cross members, one under the radiator, one just aft of the gearbox and the third just aft of the rear axle, are provided. The two forward cross members carry the subframe used to support engine and gearbox. Five Stewart wire wheels, with four 27 x 3½ in. clincher tires, are furnished as standard equipment. The road clearance is 8 in.

The 5 gal. gasoline tank and the spare wheel are carried at the rear of the chassis. Fuel feed is by the Giorgio Georgy vacuum system to a 1 in. Zenith carbureter. Inlet and exhaust manifolds are cast in one piece, to provide heat to vaporize the charge. The car is claimed to make 35 miles per gallon of gasoline.



Amidship transmission used in Moller chassis.

One of the novel features of the car is the adjustable steering gear. This is of the worm and wheel type and is mounted on top of the chassis frame, with the steering arm outside. It can be furnished for either right or left hand drive, as desired. The steering column can be raised and lowered from the driver's seat to suit the driver's convenience. It is locked in the desired position by an adjustable link, the forward end of which is connected to the dash.

It will be noted that nearly all the units in the car are designed especially for use in the Moller chassis. The small size and light weight of the car made it impossible to use many standard parts, hence the car is not an assembled product in the ordinary sense of the term, though many of the units are, for the present at least, being built outside the Moller factory—some of them by makers of standard parts. The aim of the Moller brothers, who are Danish engineers, has been to produce by American methods a high grade light car incorporating many European features of design and equipment, and primarily for sale in Europe.

Cars sold in the domestic market are expected to retail for about $2,000.

Motor Vehicles in Denmark

A CENSUS of motor vehicles has been taken in Denmark each year since 1909 except during the years 1918 and 1919. The latest census was held on Sept. 1, 1920, and showed that on that date there were in the country 11,594 private passenger cars, 2276 motor cabs and omnibuses, 3787 motor trucks and 12,182 motorcycles. The following table gives a general survey of the growth of motor transportation in Denmark:

Date of Census	Passenger Cars	Trucks	Motorcycles
Sept. 1, 1920	13,870	3,787	12,182
May 29, 1917	6,360	930	8,633
Sept. 1, 1916	4,995	723	7,766
Sept. 1, 1915	3,773	558	6,347
Sept. 1, 1914	3,079	351	5,248
Sept. 1, 1912	1,025	162	4,507
Sept. 1, 1910	920	77	3,478
Sept. 1, 1909	699		3,167

In connection with the above table it should be mentioned that in the figures for 1920 are included the cars, trucks and motorcycles in South Jutland, or that portion of Northern Schleswig which fell to Denmark as a result of the plebiscite last year. The census showed that district to possess 463 passenger cars, 41 motor trucks and 160 motorcycles. The rapid increase in the number of cars and trucks in Denmark during the past three years is noteworthy. The increase was especially great in the country districts.

ALL tests on recent aluminum solders have been completed by the Bureau of Standards, and Circular 78, "Solders for Aluminum," will now be revised to include these tests. In spite of claims made by those interested, no solder for aluminum has yet been found which will withstand the corrosion test, although the fused zinc chloride solders withstand corrosion for the greatest length of time.

Renault Now Producing Wheel Type Tractor

Has abandoned track-laying type and other tank features in new wheel type model which is much lighter than earlier machines. Built-up frame and axle with bevel and planetary reduction are employed.

By W. F. Bradley

FIRST of all French automobile manufacturers, Renault got into the agricultural tractor business a few weeks after the armistice with a track-laying type of machine based on his war tank design. Naturally the machine was lightened for the special work it had to perform, but in order to gain time some of the purely war tank features were retained. A later edition of the same tractor made its appearance a year ago with modifications suggested by a year's practical experience on the land.

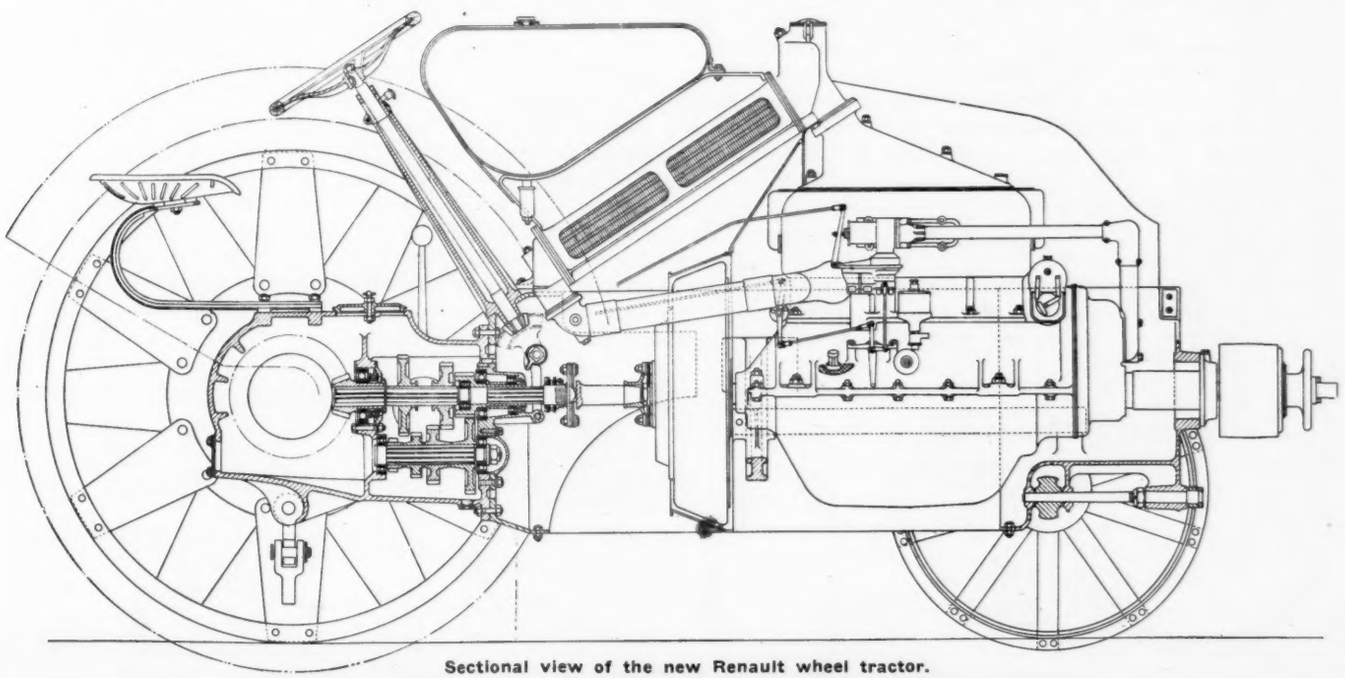
A third model of the tractor has now come forth, and although this is the direct successor of the war tank machines, all the military features have disappeared. Renault has abandoned creeper bands in favor of wheels, and although the two types are being produced, their capacities are so nearly alike that it is reasonable to suppose the endless track machine will ultimately disappear.

The engine is a block-cast, 95 x 160-mm. (3.74 x 6.3-in.), four-cylinder type, with fixed L-head, high-tension ignition, thermo-syphon water circulation, and a pump-circulated oiling system. This type of engine has long been standardized by Renault, for in addition to being used on his tanks, with a special lubricating system, it is employed on his 3-ton trucks. The radiator is placed back of the engine and inclined at about 45 degrees; a strong draft of air is assured through the tubes by the flywheel fan, and there is a lesser tendency for dust to enter under the hood than with the radiator mounted in front. An air washer is not used.

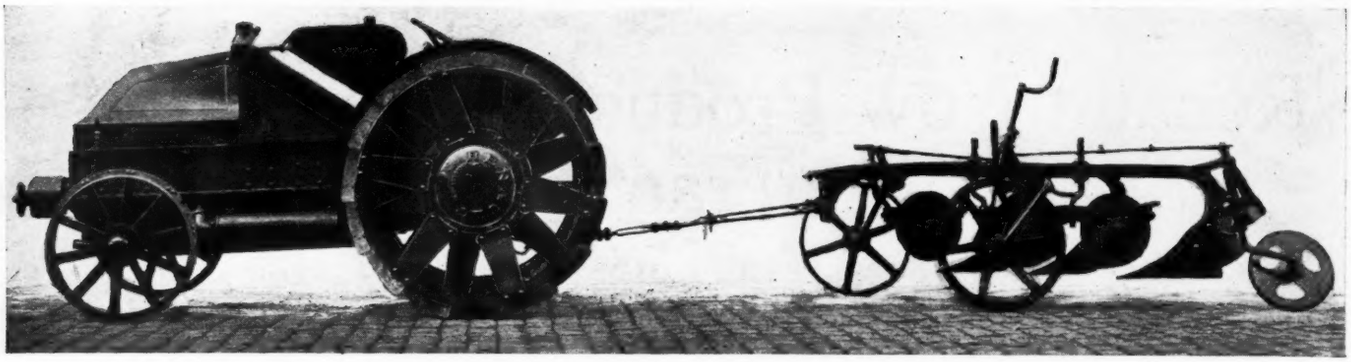
The new Renault tractor occupies a midway position between the frameless type of machine as represented by the Fordson and the automobile type with full frame. There are two channel section main frame members united at the front by a cast-steel cradle in which the front axle is pivoted, and at the rear by another cast-steel member which forms a face plate to which the united gearbox and differential housing is bolted. A channel section subframe carries the engine, and this latter is connected to the gearbox by a short shaft with two flexible steel disks. This design permits the use of the stock truck engine and at the same time reduces total weight of the machine compared with a frameless tractor. The total weight of the Renault wheel tractor is given as 2 tons, whereas the track-laying type machine, with the same engine, weighs more than 3½ tons.

The rear axle housing is built up with a cast-steel center and steel tubes, and forms a unit with the gearbox, the housing of which is also a steel casting. This unit is bolted to the face plate of the rear cross member of the main frame, in which is mounted the engine and radiator.

An inverted leather-lined cone clutch is used, and



Sectional view of the new Renault wheel tractor.



The Renault wheel tractor with plows attached. Note muffler carried below tractor frame

the gearbox gives three speeds and reverse, the ratios corresponding approximately to 1¾, 2½ and 7 miles an hour. Bevel gears give the first reduction from the drive shaft to the axle shafts, but there is a final reduction by planetary gears and internal spur pinion within the rear axle hubs. This type of final reduction has been in use for a considerable time on Renault 7-ton trucks and has given very satisfactory results.

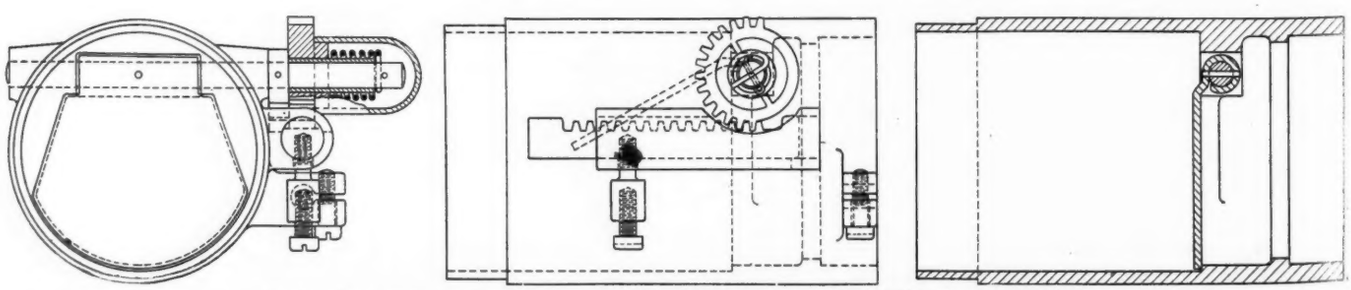
The rear wheels are built up of sheet-steel rims with flanged edges and sheet-steel spokes riveted to the hub carrying the final reduction gears. Diameter of the wheels is 45½ in. and width 11 4/5 in. The front wheels are of the same design, and have a diameter of 27½ in. They are mounted on a straight axle, which is pivoted to the forward cast-steel cross member of the main frame. There are no springs, and, as the rear is rigid, the entire chassis pivots around the point of attachment to the front axle. A clutch-controlled pulley for belt drive is mounted on a forward extension of the crankshaft.

A Flexible Choke Valve

THE carbureters of practically all American cars are now fitted with a choke valve in the air inlet by means of which the vacuum around the spray nozzle can be increased while starting the engine and while warming it up, with the result that a richer mixture is fed to the engine than would otherwise be the case. This richer mixture is required because the fuel contains some constituents of very high boiling point which are not vaporized when the engine is cold and therefore really do not count in the combustible mixture. The ordinary choke valve is a butterfly valve which is controlled by hand from the driver's seat. One disadvantage of this type of valve is that with it the vacuum in the carbureter increases exceedingly fast with an increase in engine speed, and that then excessive amounts of fuel are drawn in.

A type of choke valve intended to obviate excessive enriching of the charge at the higher engine speeds is being marketed by the Gasoline Economy Co. under the name of the Winters flexible choke valve. It is in the form of a flap valve which is held to its seat by a coiled spring. The spring comprises quite a number of complete convolutions of wire, so that its torsional force is not very much different whether the valve is open or closed. As the speed of the engine increases, the increased suction opens the valve farther, but this increase in the opening of the valve in turn tends to keep down the suction. According to a test made for the manufacturers, the suction in the carbureter with the Winters flexible choke varied from 0.15 in. of mercury at 300 r.p.m. to 0.65 in. of mercury at 1500 r.p.m. and was then only imperceptibly higher than when no choke at all was used. With the regular choke, 30 deg. open the vacuum rose to 6.4 in. of mercury at 1,350 r.p.m. A rack and pinion mechanism is provided for easy adjustment of the spring force.

THE competition between road and rail transport may lead to a wasteful use of both these agencies unless steps are taken to effect the necessary degree of coordination. Arthur Watson, general manager of the London and North-Western and Lancashire and Yorkshire railways, dealt with this aspect of the question in a recent address to the Manchester Statistical Society. Although the committee which inquired into the subject was in the main hostile to the granting to railways of extended powers to engage in road transport, Mr. Watson believes that the telegraph and telephone communication systems established by railway companies could be utilized with advantage to organize transport by road as well as rail. Any fear of a universal transport trust being brought into existence by the intrusion of railways into the arena of road transport could, it was intimated, be dismissed as groundless.



Sectional views of the Winters flexible choke valve and its operating mechanism.

Examples of European Practice in Three and Four-Point Suspension

Tendency is toward three-point type though majority of cars still employ the four-point arrangement. One maker employs a self-aligning ball bearing as support for extended front end of crankcase.

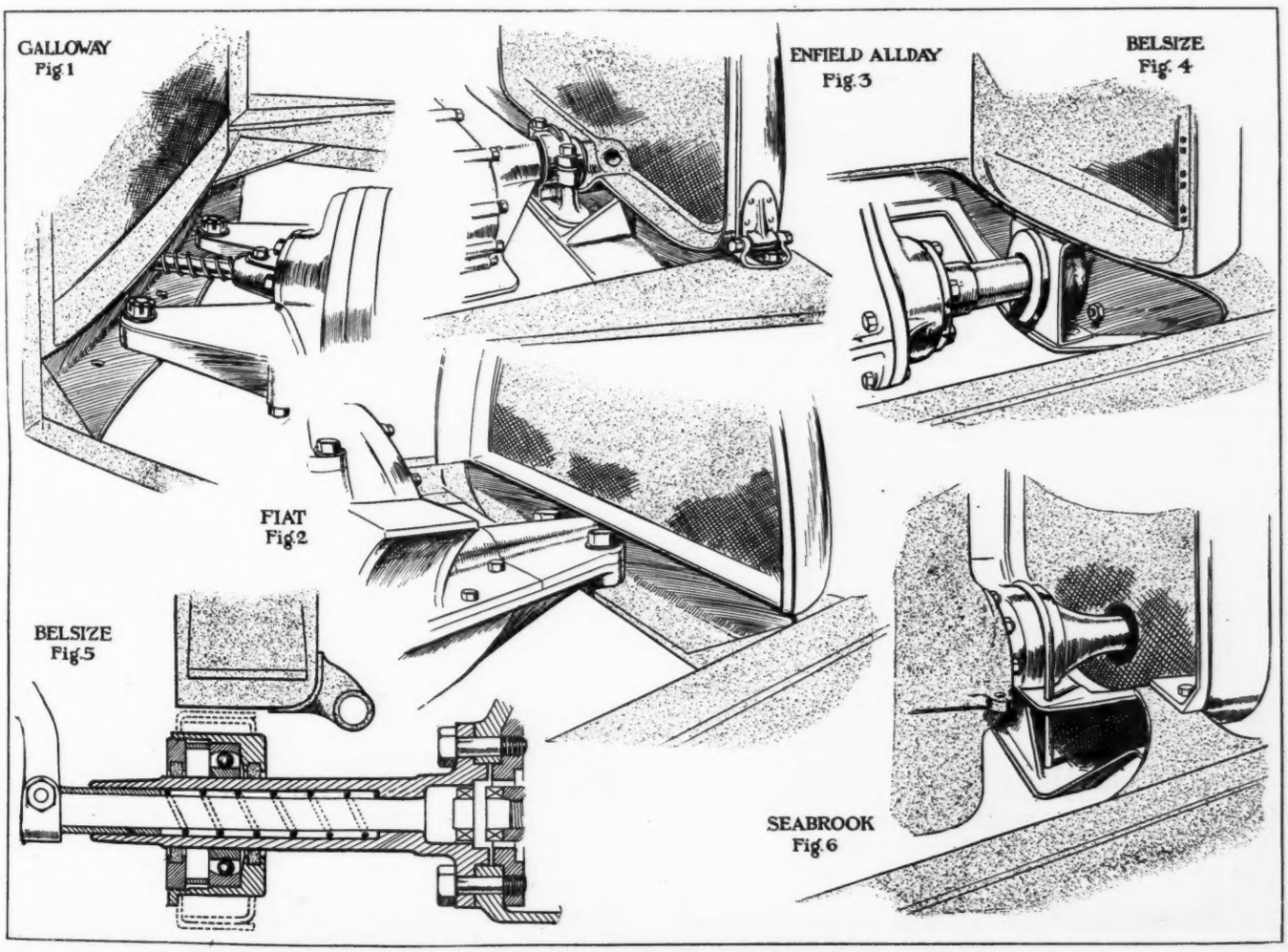
By M. W. Bourdon

THERE is a gradually increasing movement among European, and particularly British, designers to drop the four-arm crankcase in favor of a three-point support for engine or power unit, though admittedly the majority of European cars still have the former or some equivalent—for example, a four-point supported sub-frame or side extension webs of the crankcase.

But when the three-point arrangement is aimed at there is a great divergence in the manner in which the object in view is approached. Some designers apparently fear to go all the way, and, while discarding the two front arms extending from the side of the crankcase, still retain a two-point front end support. Examples of this compromise are seen in Figs. 1 and 2 herewith, the first being a sketch of the Galloway (one of the productions of the Beardmore interests), the second illustrating the Fiat front end.

Obviously the latter approaches nearer to the three-point ideal, and, compared with some single front end suspensions, is clearly a cheaper arrangement to produce. But, like the Galloway arrangement, it is a four-point suspension, nevertheless, and something has to yield when there is frame distortion; probably the frame webs accommodate themselves to the conditions of the moment.

The hemispherical trunnion bearing for the nose of the crankcase, somewhat on the lines of that shown in Fig. 3, is most usually favored by engine designers with



Examples of British and Continental practice in supports for front end of crankcase

three-point suspension in view. In the case illustrated the cross member is an angle casting with stiffening webs each side of the center, as shown; but as a rule a pressing of the usual channel section is favored, which necessitates a modification of the trunnion bracket—unless there is a pronounced dip in the cross member or a relatively high crankshaft center. This modification generally consists of securing the bracket to the vertical web of the pressing by horizontal bolts. But whether the bracket be supported as shown or otherwise, a split bronze bushing with a parallel bore and hemispherical exterior surface is almost invariably an accompaniment, with a grease cup in the bracket cap.

What is probably unique in front end engine mountings is the arrangement shown in Figs. 4 and 5, which is used on the Belsize, a medium-priced British car. To secure the effect of a spherical attachment to the frame the front extension of the crankcase is encircled by a self-aligning ball bearing mounted within a cage or cylindrical housing, itself supported by a piece of reversed channel steel riveted to the front cross member. Two felt gland washers are used, the front one located in a groove of a ring nut screwed into the bearing house from the front. A point about this mounting is that it allows for end movement between the parts, besides providing a spherical mounting, for the crankcase extension is not secured axially to the inner ball race or to any other detail. Apart, however, from direct considerations of cost, this Belsize mounting is open to criticism owing to the difficulty of insuring perfect alignment of the holes in the riveted channels for the bearing housing.

The last example, shown in Fig. 6, has greater possibilities as a production job, though the illustration represents the front end engine support on a British car (the Seabrook) with a very small output. The front end extension of the crankcase is, seemingly, larger than need be, though this is a fault on the right side in view of the fact that in this case it is of aluminum. The need for welding a triangulated web stiffener within the channel of the cross member will probably constitute no objection to the production expert, in view of the elimination of that *bête noir* of the machinist—*i.e.*, a spherical surface.

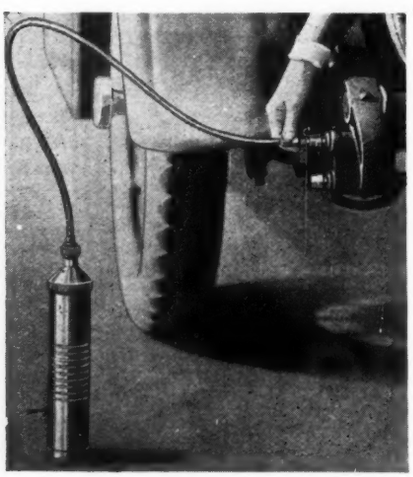
This last scheme is obviously capable of improvement. In the first place, the aluminum surface in contact with the cross member will clearly soon be indented and become a source of noise and hammering. But it should not be difficult to overcome this in a simple and cheap manner—if merely by the provision of a cradle of brass or steel, located by the U bolt, to form an immediate support of quite considerable area. Admittedly, this arrangement, lacking a spherical bearing, would not provide the ideal front end support for a three-point suspension, but it would go a very long way and take up the effects of frame distortion.

An Oil Pressure Reservoir

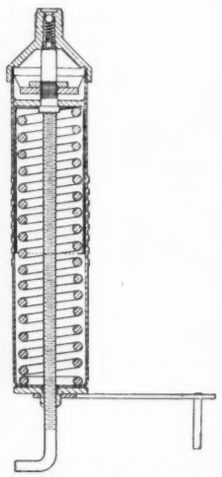
AN oil gun designed for use in a chassis lubricating system consists of a nickel plated metal bottle in which are located a piston and a heavy coil spring. The oil is contained in the upper part of the bottle and is put under pressure by the piston and coil spring. A length of flexible tubing is attached to the top of the bottle and the end of the tubing is equipped with a check valve which is released by the special fittings which replace the grease cups and oil cups on the car.

In fitting the gun, the cap at the top should not be removed until the full tension has been taken off the piston by contracting the spring to the fullest possible extent. This is done by inserting through a hole in the bottom of the bottle, the long, threaded rod which is supplied with the outfit. This rod contracts with a socket in the bottom of the piston. The rod is screwed into place and then the nut run up this rod as far as it will go. Then the wrench is used to bring the piston back to as near the bottom of the bottle as possible. This comprises the spring and releases all pressure from the top of the bottle. The cover is then removed and the bottle is filled, the cap replaced, the tension taken off the spring by turning back on the nut at the bottom, the threaded rod removed, the bottom cap replaced, and the oil gun is ready for service.

The device described is known as the Romon oil gun and is manufactured by Roberts & Monroe.



Romon oil gun in use



Sectional view of Romon oil gun

An Optical Pyrometer

A SIMPLE and cheap optical pyrometer known as the Pyromike has been developed in England by the Rudge-Whitworth Laboratories. It weighs only 5½ ounces and can be carried in the vest pocket. It is suitable for measuring all temperatures from a red heat upward. Its appearance resembles one-half of a pair of binoculars, or a little telescope 1¼ in. diameter by 2¼ in. long. Within the body of the instrument is a cell, composed of two circular glass disks joined by a piece of rubber tube, the latter being surrounded by a spiral spring. This cell is filled with colored liquid, and can be collapsed lengthwise by the rotation of the end of the instrument relatively to the eyepiece and body. The amount by which the cell is shortened is read off a graduated scale on the barrel, somewhat similar to that of a micrometer. To determine the temperature of any article, the latter is looked at through the instrument, and the cell slowly lengthened by rotating the end ring until the article ceases to be visible on account of the increased length of the light-absorbing liquid which has to be traversed by the light. The temperature can then be directly read from the scale engraved on the body. Each instrument has a total range varying from 250 deg. to 600 deg. C., depending on the kind of temperature which it is specially arranged to measure.

An Analysis of Elements Which Govern Automobile Fuel Economy

Part II.

The influence of air-fuel proportions, metering characteristics of carbureters, mechanical efficiency at part load, ignition timing and the size and speed of engines, is considered. A summary of theories and facts relating to fuel knock is also given, with pertinent comment thereon.

By H. C. Dickinson, S. W. Sparrow and R. L. Wales*

Influence of Air and Fuel Proportions Upon Engine Efficiency and Power

THE carbureter exists to proportion air and fuel so that the engine can deliver its maximum power or attain its maximum efficiency. Experiments to determine what these proportions should be have been made usually upon multi-cylinder engines. Faulty distribution influences the results thus obtained, since it necessitates an excess of fuel being supplied to some cylinders in order that the other cylinders can receive sufficient fuel for satisfactory operation. These results are, however, of immediate value, as they show what proportions the carbureter must furnish to cope with the faults of existing induction systems and yet give satisfactory engine operation.

The chemical combining proportion of air and a given fuel is a fixed quantity. In practice, a lower air-fuel ratio usually gives greater power and a higher air-fuel ratio greater economy. One reason for this is the lack of an intimate mixing of the air and the fuel. Supplying excess air tends to make certain that all the fuel is intimately associated with sufficient air to insure its combustion and thus to attain the maximum economy.

Investigators are in fairly close agreement as to the air-fuel proportions for maximum power, finding ratios of from 11 to 1 to 13 to 1 best in this regard for ordinary gasoline. A recent series of tests at the Bureau of Standards has shown that with an aviation engine having compression ratios of 5:3, 6:3, 7:3 and 8:3, the maximum power was obtained with air-fuel ratios of from 13 to 1 and 14 to 1, with air densities of from 0.025 to 0.075 lb. per cu. ft. This was, however, with aviation gasoline, a more volatile product than the commercial fuel.

Work done at the Bureau of Standards and elsewhere shows that the efficiency with any proportions with which the engine will operate is independent of the power developed. The same conclusion seems to have been reached by Ricardo. Failure of the engine to operate properly at very low loads with mixtures as lean as those giving maximum efficiency at greater loads seems to be due to dilution by the residual products of combustion. In present types of automobile engine the maximum power is obtained with air-fuel ratios of from 11 to 1 to 13 to 1 and the maximum efficiency at ratios in the neighborhood of 16 to 1, if the engine will operate regularly with such mixtures. Where dilution by the products of combustion necessitates richer mixtures, the maximum efficiency is attained with the leanest mixture at which the engine will operate regularly.

Metering Characteristics of Carbureters

As any wide departure of the mixture ratio from that corresponding to the maximum economy with a changing load on the engine may mean a serious waste of fuel, the load-mixture characteristics of several widely used carbureters are of interest. It might be assumed that since the pressure reduction causing fuel flow depends on the velocity, at a constant density, through the venturi in the normal type of carbureter, the gasoline discharge, and consequently the mixture ratio, would be determined solely by the weight of air used per second, or by the engine load. It is to be remembered, however, that a given weight of air may be used under very many different combinations of throttle position and manifold depression, corresponding with different relations of torque and speed of the engine. Experiment shows that with the usual location of the throttle, throat suction and, consequently, mixture ratios are affected not only by quantity of air passing but by the degree of opening of the throttle itself. Tests at the Bureau made with six widely used carbureters for various rates of flow, each at several relations of throttle position and manifold depression, show that the mixture ratio varies in one case from about 10 to 1 to nearly 17 to 1, and between still wider limits when comparing the different makes of instrument. The actual mixture proportions depend largely upon the particular adjustment used, but the change in proportions with change in load involve decreased economy under some conditions.

The Mechanical Efficiency of Engines, with Particular Reference to Part-Load Conditions

The mechanical efficiency of the engine is the ratio of the power delivered at the clutch to that developed in the cylinders. The difference between these two powers is used to overcome the internal friction of the engine, drive the auxiliaries and draw in and exhaust the charge. All of this power loss is included in the term "friction horsepower," although some of the elements are not due, strictly speaking, to friction. Thanks to the widespread use of the electric dynamometer, the determination of this friction horsepower is comparatively easy. It con-

*Members of the staff of the Bureau of Standards, Washington. Condensed from appendices to the paper by W. S. James presented at the Semi-Annual Meeting of the Society of Automotive Engineers.

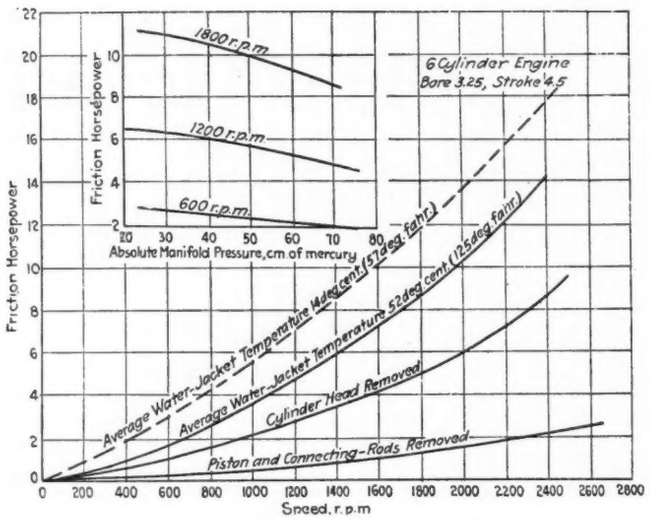


Fig 2—Relation between Friction Horsepower, Speed and Manifold Pressure Under Various Conditions.

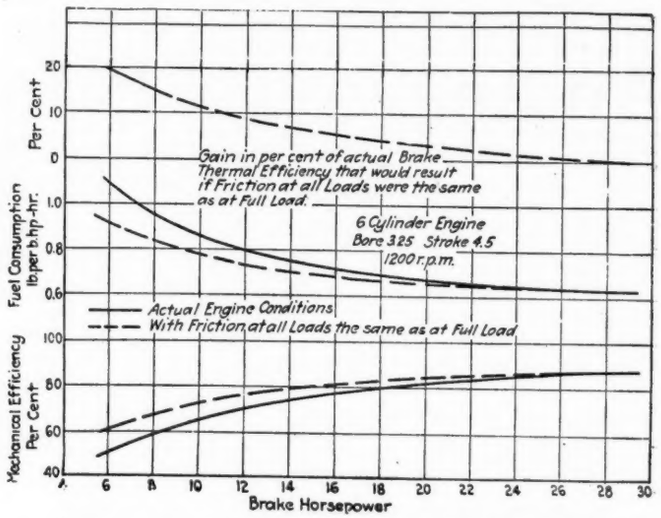

Per Cent
Gain in per cent of actual Brake Thermal Efficiency that would result if Friction at all Loads were the same as at Full Load.
6 Cylinder Engine
Bore 3.25 Stroke 4.5
1200 r.p.m.
Fuel Consumption lb. per b.hp.-hr.
Actual Engine Conditions
With Friction at all Loads the same as at Full Load
Mechanical Efficiency Per Cent
Brake Horsepower

Fig. 3—Results of Tests on a Six-Cylinder Engine Showing the Relation Between Mechanical Efficiency, Fuel Consumption and Brake Horsepower.

sists in measuring the power required to drive the engine without fuel or ignition, while keeping all conditions as nearly as possible the same as when the engine is operating under its own power.

Fig. 2 makes clear the need for maintaining the jacket water temperature at its normal value during such determinations. At 1000 r.p.m. the friction with a jacket water temperature of 14 deg. C. (57 deg. Fahr.) is more than 50 per cent greater than when the temperature is 52 deg. C. (126 deg. Fahr.). This difference is a consequence of the higher viscosity of the oil at the lower temperature. One should not infer from these curves that the proper viscosity for an oil is that which gives the minimum friction. The viscosity must be high enough to prevent metal-to-metal contact, even when the oil is diluted with fuel. Nevertheless, the curves do illustrate the excessive friction loss that will ensue from use of oil of a viscosity unnecessarily high.

Comparison of Frictional Losses

A rough comparison of the magnitude of the several elements that comprise the friction loss is given by the lower three full-line curves. The results show piston friction to be responsible for a large proportion of the total loss. At 2400 r.p.m., with the cylinder head removed, the power required to drive the pistons and the connecting rods is three times as great as that to operate all the rest of the engine.

It is frequently assumed that the difference between the friction horsepower measured under normal conditions and that obtained with the valves or cylinder head removed represents the pumping loss. Values of the pumping loss obtained in this manner are considerably higher than those given by actual indicator card measurements. It appears, therefore, that the removal of the cylinder head not only eliminates the pumping loss but also reduces the piston friction through the change in pressures that results. This statement is made reluctantly because it has been found that the friction of the engine under power is not sensibly different from that when the engine is driven by the dynamometer, in spite of the lower pressures in the latter instance. At present the best that can be said is that measuring the pumping loss by this method of difference is open to question.

It is well known that the mechanical efficiency of the automobile engine decreases with a decrease in the load. One cause is the increase in the friction horsepower that results from closing the throttle. Fig. 2 shows this effect at three speeds, the absolute manifold pressures indicating the amount of throttle opening. That this is not the major cause of the low efficiency will be evident from Fig. 3. Here the mechanical efficiency and fuel consumption are plotted against the brake horsepower. The fuel-consumption calculations are based upon 0.55 lb. of fuel per i.hp.-hr., a value that is assumed to be constant over this load range. The dash line curves show results that might be obtained if the friction horsepower did not increase with the closing of the throttle. At 20 per cent load the upper curve shows a 20 per cent increase in the efficiency to be possible; that is to say, a car now going 15 miles on a gallon of fuel could then go 18. Even under these conditions, at 20 per cent load the specific fuel consumption would be 40 per cent greater than at full load. The low efficiency of the automobile engine is thus seen to be due primarily to the fact that it normally operates at a small percentage of its maximum power. This reserve power, however, if not actually a necessity, is at least a luxury that will not be willingly relinquished.

Emphasis may well be placed on the importance of keeping the friction as low as possible because its influence is multiplied at reduced throttle. For example, under the conditions of Fig. 3 an increase of 1 friction hp. would increase the fuel consumption at full load only 3 per cent, but at 20 per cent load, 9 per cent. Small gains in mechanical efficiency thus justify the expenditure of considerable effort toward their attainment.

Ignition Timing

The point in the cycle at which the ignition spark should occur in order that the engine efficiency may be a maximum is affected both by the speed of the engine and by its load. Many systems are constructed so that the timing of ignition changes with any change in the speed. There have been, in experimental use at least, devices which enabled the ignition timing to be controlled by the manifold pressure in an endeavor to meet the requirements of changing load.

There seems to be a dearth of experimental data on the amount by which the timing should be changed with changes in speed and load. Fig. 4 is typical of the data that are required. It shows the brake mean effective pressure obtained with various degrees of spark-advance for two speeds and three loads. The length of the blocks adjacent to the curves indicates the range of spark-

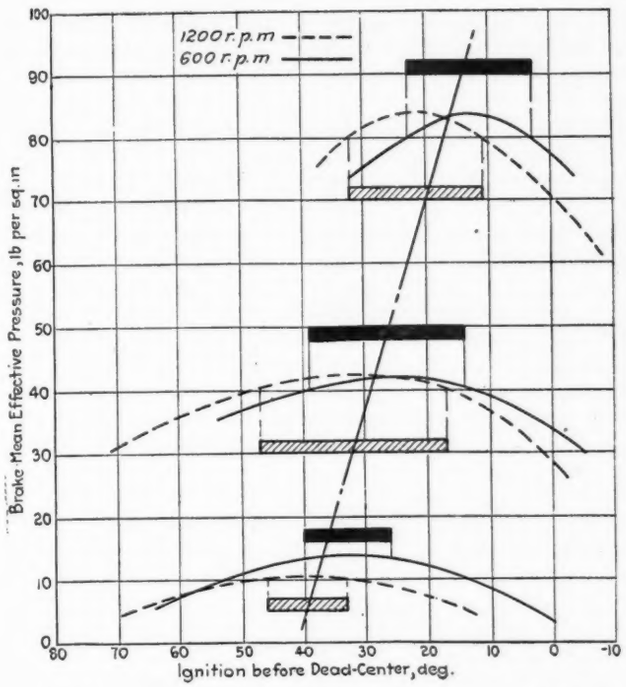


Fig. 4—Influence of Ignition Timing Upon Brake Mean Effective Pressure

timing within which the brake mean effective pressure will not be more than 5 per cent less than its maximum value. Inasmuch as the fuel consumption does not change appreciably so long as the speed and the throttle opening are kept constant, a change in the brake mean effective pressure means a corresponding change in the thermal efficiency. A compensation for load changes that would give the spark-advance brake-mean-effective-pressure relation shown by the dash line would be fairly satisfactory for the two speeds tested. Data of this sort should be obtained over the range of speeds and loads at which the engine will operate in service.

It is a common belief among automobile drivers that the maximum efficiency is obtained with the maximum advance at which the engine will operate without knocking. Under the conditions shown by the lower curves no knock was obtained even with the maximum advance, so that an adjustment in accord with the aforementioned belief would result in a decrease in efficiency of over 50 per cent. With manual control of spark-timing the possible advance should be limited to prevent this excessive loss of efficiency.

Fuel Knock

The phenomenon variously known as fuel knock, detonation and pinking has assumed so much importance because of the practical limitations it imposes on compression ratio and consequently on fuel economy that there has come to be much discussion and more speculation as to the exact nature of what takes place in an engine cylinder when this phenomenon occurs. However, neither the discussion nor the mass of information gained, directly and indirectly, from experiments has led to a definite understanding or even to a satisfactory theory of the nature of the phenomenon. The term detonation implies that something occurs in the cylinder which corresponds to the detonation of a high explosive. Such conditions are easily produced in explosive gas mixtures, but there is scant proof that the same thing occurs in an engine cylinder. In fact, some of the experimenters most familiar with these phenomena doubt the possibility of such occurrence.

To clear up some of the indefiniteness, an attempt has been made to enumerate the various facts and observations concerning fuel knock and to discuss the bearing of these facts on the several theories that have been advanced to explain the nature of the phenomenon. Fuel knock, as ordinarily understood, is characterized by the following phenomena:

(1) A very sharp metallic noise
(2) Bright yellow flame within the cylinder
(3) Decrease in power
(4) Increase in heat rejected to the jacket water
(5) High instantaneous cylinder pressure
(6) Destructive mechanical effects
(7) Occurrence of smoke in the exhaust
(8) Preignition, in most cases

Observations show that the occurrence and intensity of the knock are intimately related to the following factors:

(1) Chemical composition of the fuel
(2) Ignition timing
(3) Compression pressures
(4) Mixture ratio
(5) Position and number of spark-plugs
(6) Shape of cylinder and piston-head
(7) Temperature of the charge
(8) Cylinder temperatures

Aside from more or less random speculations, there are at least three rather definite theories or hypotheses presented as explanations of the character of this knock phenomenon. These are (*a*) what may be termed the mechanical-knock theory, which explains the sound by means of some mechanical knock or impact between parts of the engine mechanism—as, for instance, between cylinder wall and piston, or between shaft and bearings. This theory does not attempt to explain the cause of pressures which must exist to produce these mechanical impacts. On this theory it would be assumed that there is no necessary difference between the so-called fuel knock and any other purely mechanical knock, except that the former is primarily due to cylinder pressures, while the latter may be due to inertia effects, etc.

Ricardo's Fuel Knock Theory

Another theory (*b*) is that proposed by Ricardo, which explains the sound and other phenomena as due to a sudden very rapid increase in cylinder pressures. It is assumed that a portion of the charge, compressed to the ignition point by the expansion of the portion first ignited, burns simultaneously, causing a very sudden rise in pressure. This theory does not contradict the former, but assumes that the sound may be produced either by the sudden distortion of the cylinder walls by gas pressure or by mechanical impacts in the mechanism, due to the sudden pressure increase. It seems to require the assumption that a fuel will show a tendency to knock somewhat proportional to its spontaneous ignition temperature, but it makes no attempt to explain the nature of the explosion or detonation which occurs in the compressed charge.

A third theory (*c*), which may not necessarily contradict either of the foregoing, is the so-called detonation-wave theory. According to this the process of explosion is explained somewhat as follows: When ignited the wave of combustion spreads out from the ignition point at a relatively slow but increasing rate. Under certain conditions before the flame has filled the combustion space, its rate of motion increases to what is known as detonation velocity, a velocity so high as to constitute practically the simultaneous burning assumed by Ricardo. An interesting theory regarding the nature of the chemical reactions which account for the increase in flame

velocity has been proposed by Midgley. Such detonation waves in gas mixtures were first discovered in 1881, independently by Berthelot and by Mallard and Le Chatelier. These velocities and characteristics are reasonably well understood. The velocities are from 1 to 2 miles per sec., sufficient to account for the sound and pressure effects which are observed in engine cylinders. But in direct experiments it seems never to have been possible to attain these velocities within the short space in an engine cylinder.

Of the three theories, the first does not attempt an explanation of the phenomenon. Whatever causes the characteristic sound is certainly actuated by the sudden increases in cylinder pressure which have been measured repeatedly. The direct causes of these increases in pressure are of more interest than the source of sound, and the only attempt at explanation of sudden pressure increases is found in the theories (*b*) and (*c*); hence these appear of greater interest. In considering the bearing of known and observed facts on these theories, it is important to note that the one important difference between the two theories is that (*b*) assumes that the cylinder pressures are true pressures produced by a sudden increase of pressure throughout the cylinder, while (*c*) includes the assumption that the high pressure may be localized impacts of the detonation wave. This means that the maximum pressure may not be by any means the same at different points within the combustion space.

Phenomena Which Accompany Fuel Knock

The short metallic sound produced by fuel knock, particularly in light-weight cylinders, suggests the impact of a very light hammer on a heavy anvil. Observations of the velocities imparted to a light steel rod resting on the top of a Liberty engine cylinder during detonation show a number of interesting facts. For instance, it is found that under detonation conditions this cylinder head is distorted with a velocity which might correspond to that of a tuning-fork, corresponding to that of a sound having a pitch above the range of the piano keyboard, or of the order of 4000 vibrations per sec. The action of the cylinder pressure is, therefore, entirely sufficient to account for the characteristic sound produced.

The characteristic bright yellow flame within the cylinder, which is observed to accompany the fuel knock, has been shown by stroboscopic observations to be of very short duration, occupying not over 10 deg. rotation of the crankshaft or about 0.001 of a sec. in time. Evidently the flame phenomenon is worthy of more careful study as to its exact time of occurrence, its duration and the characteristics of the intermediate products of combustion. Such information might go far to explain the knock phenomena.

A decrease in the power output accompanies knock, but there seems to be no very close relationship between power and knock. Apparently fuel knock of itself does not reduce the power, but rather the conditions at which the knock occurs are not those for maximum power. Whether these conditions would produce the maximum power with a fuel that did not knock cannot be answered with certainty.

It has been observed that whenever fuel knock develops, due to a change in the timing or pressure, or a change in the fuel, there is an abrupt increase in the heat rejected to the jacket water. There are several possible explanations of this: (*a*) the increase in temperature and pressure may directly increase jacket losses by increasing radiation and convection to the cylinder walls; (*b*) the increase in pressure may increase leakage past the piston; (*c*) high-velocity detonation-waves, if they exist, may transmit energy to the walls by impact, and (*d*) the burning of oil directly on the cylinder walls, due to high temperature of the charge, may add to the heat loss.

Whatever the immediate cause of this increase of heat loss, the fact is significant. According to either of the two proposed theories, assuming localization and burning of a portion of the charge under increased pressure, it might be expected that the excess heating effect would be most pronounced at the particular location where this local combustion took place. Experiments to verify this by thermoelectric couples inserted in the cylinder in various positions with relation to the firing plug, show no significant difference in the temperature rise for different locations. These observations seem to show that the excess heating effect during knock is *not* localized as might be expected. The effects of increased radiation and of combustion of oil would be in accord with these observations.

Extremely high cylinder pressures have been found by different observers by various indicating devices. In one case, with a compression ratio of about 5 to 1, pressures of 1300 lb. per sq. in. were observed to occur consistently at each explosion; this pressure being the maximum measurable with the apparatus at hand. It is safe to assume that the maximum pressures were at least 1500 lb. and probably much higher. These pressures occurred with kerosene as fuel.

The amount and distribution of these pressures is of importance in relation to the two theories advanced. According to the Ricardo theory, the pressure may be uniformly distributed throughout the combustion chamber, although this is not a necessary assumption. If uniformly distributed, the pressure must not exceed that which could be produced by burning all the fuel at constant volume at intake pressure and then compressing adiabatically to the final volume. In fact, due to the nature of the process, the pressure can hardly exceed that which would be produced by compressing the charge adiabatically and burning it at constant volume under compression.

Possibility of Localized Pressure

On the other hand, the detonation theory presupposes that the maximum pressures are localized and places no limit on their magnitude below the calculated impact pressures of detonation waves in the compressed charge. This limit would be between 5000 and 7000 lb. per sq. in., but it is important to remember that these are not true sustained pressures, but resemble those produced by the blast from a high explosive; that is, they would last only a few millionths of a second. It is very doubtful if any indicator in use is capable of responding to such instantaneous pressures, other than to register a kick, so to speak.

As for experimental results, some indicator observations seem to show differences in the maximum pressures for different locations of the firing plug; other results worthy of equal confidence fail to show any such differences whatever. At the Bureau of Standards the maximum indicator pressure, the increase in combustion-chamber temperature and distortion of the cylinder head have all been carefully analyzed for different locations of the firing plug to detect any localization of pressures and none has been found. This appears to constitute strong evidence that no marked localization of pressure occurs which depends directly on spark plug location.

As noted above, the maximum pressures reached are occasionally as high as 1500 lb. per sq. in. at least. If they are normal uniform cylinder pressures, they cannot exceed the pressures that would be produced by com-

plete simultaneous combustion of the charge before compression, as stated. Moreover, from an examination of the pressure change it is evident that comparatively little of the charge is burned much before dead center; therefore, in practice, the knock pressures cannot exceed maximum computed pressures unless they are due to some effect other than normal combustion of the charge. Maximum pressure produced by the latter cause can be determined approximately. The maximum temperature reached on compression in the ratio 5 to 1 and combustion of a normal charge, taking account of dissociation, is given by Pye as from 2500 to 2700 deg. C. (4532 to 4862 deg. Fahr.). If dissociation is neglected, the temperatures are computed as about 3000 deg. C. (5432 deg. Fahr.). As the effect of dissociation is to lower the temperature, with a slight increase in volume relative to temperature, take the higher figure. This temperature corresponds to, roughly, 3250 deg. C. (5882 deg. Fahr.) absolute. If, therefore, the pressure were 1 atmosphere before compression and 5 atmospheres after compression, and the temperature 300 deg. C. (572 deg. Fahr.) absolute before compression, the pressure after compression and combustion has a maximum value of $5 \times 3250 \div 300$, or slightly over 50 atmospheres, which is about 750, or, say, 800 lb. According to Pye's results, the temperature would be only about 500 deg. C. (932 deg. Fahr.) higher and the pressure only about 1000 lb. per sq. in., if the combustion took place before compression. Pye gives 700 lb. per sq. in. as the maximum attainable cylinder pressure. This neglects the volume of water vapor which would increase the pressures somewhat.

Remembering that these are absolute maximum pressures if Pye's results are to be accepted, pressures of over 1000 lb. per sq. in. must be due to some cause other than normal gas combustion. In other words, such pressures cannot occur simultaneously at all parts of the cylinder.

Destructive Mechanical Effects of Knock

Destructive mechanical effects are somewhat difficult to interpret. Broken spark plug porcelains, cracked piston heads and burned-out bearings, as well as general evidence of excessive mechanical stresses, accompany continued detonation, particularly in aircraft engines. But none of these effects is subject to direct measurement. An index of the nature of the pressure rises which accompany knock is had, as referred to above, by observing the height to which a light weight is projected from its seat on the cylinder head. A measurement of this height and of the deflection of the cylinder head per unit pressure change leads to the following conclusions, which can be readily computed from the following data:

(1) The maximum height is 1½ in. The deflection of the cylinder head at this point is 0.0005 in. for each 100 lb. per sq. in. rise of pressure.
(2) The rate of pressure increase required to produce this effect is, roughly, 7,000,000 lb. per sq. in. per sec.
(3) The pressure was found to rise about 550 lb. per sq. in. above normal maximum when detonation took place, and to produce this rise at the above rate would require less than 0.0001 sec.
(4) For the Liberty engine cylinder, the combustion flame must traverse the explosive mixture at a rate of *at least* 4500 ft. per sec. to produce this observed rise of pressure. It is of interest to note that this figure is in fair agreement with the detonation velocities found by Dixon for explosions in tubes.

The observed occurrence of black smoke in the exhaust may have many explanations. One of the most obvious, that it indicates incomplete combustion, is apparently contradicted by the observed fact that the indicated power, therefore the amount of energy liberated in combustion is at least as great with as without fuel knock. I know of no definite conclusions which can be drawn from this occurrence.

The frequent occurrence of preignition following violent fuel knock is a natural sequence of the increased amount of heat rejected to the jackets, spark plugs, valves, etc. It hardly needs any other interpretation.

With reference to the several factors which affect fuel knock, the general consideration that the phenomenon is intimately connected with the process of combustion would indicate that any change in conditions would affect fuel knock.

The very marked effect of the chemical composition of the fuel, and particularly of the addition of certain anti-knock compounds as demonstrated by Mr. Midgley and others, shows the extreme sensitiveness of the phenomenon. In this connection, it should be noted that the comparison of different fuels by these observers has shown that some fuels which readily ignite spontaneously do not knock, and vice versa. This seems to be strong evidence contrary to the spontaneous-ignition theory of Ricardo.

Effect of Ignition Timing

The effect of ignition timing has been shown by observations at the Bureau of Standards to be of very much more significance than previously supposed. For instance, it is proved that knock can be made to appear on cutting out one of two spark plugs, or under other conditions to appear when the second plug is switched in; and these effects are apparently due solely to the changes in the effective timing of the combustion relative to piston position. The use of two plugs in effect advances the timing. It is shown, also, that knock can be prevented much more readily and with less loss of power by careful regulation of ignition timing than had been supposed. However, it is difficult to draw any conclusions from these facts as to the nature of the fuel knock.

The other factors enumerated, such as the compression pressure, mixture ratio, temperature of the charge, and temperature of the cylinder, seem to offer no direct evidence as to th probable validity of the two theories under consideration. They might, however, afford valuable data if the nature of knock were better understood.

The number of ignition points and their relation to the shape of the combustion space seem to be of significance. It appears to be a fact that the larger the number of ignition points, and the nearer these are to all portions of the charge, the less is the tendency to fuel knock. The much-discussed subject of turbulence appears to be probably of significance mainly as it affects the distribution of the burning mixture. Distribution of burning charge should be nearly equivalent to distribution of ignition points. Obviously the maximum rate of pressure increase which can be produced by normal burning occurs with the greatest amount of flame area, but the larger the number of spark plugs the greater the total area of flame, at least at the beginning of the combustion; yet this maximum area never produces sudden pressure rises of the order observed. Something beside normal rates of burning are, therefore, necessarily involved.

The conclusions to be drawn are as follows:

(1) The two theories of fuel knock, that of Ricardo and the detonation wave theory, do not appear to be essentially contradictory but make somewhat different assumptions as to the maximum pressure.
(2) The sound produced by fuel knock can be adequately accounted for by the distortion of parts of

the cylinder, without assuming any metallic impacts.

(3) The excess heating effect accompanying detonation does not appear to be localized in any particular portion of the cylinder, as might be expected from either theory.

(4) No differences in maximum pressure when measured in different positions relative to the point of ignition have been definitely demonstrated, although some observations indicate them.

(5) The maximum pressures measured seem to exceed those which could be produced by the normal explosion of the charge. This indicates that some phenomenon such as detonation must be assumed to account for the pressures observed.

(6) The rates of increase of pressure which have been observed are such as to require the existence of some such disturbance as detonation, as an adequate explanation.

(7) It has been shown that fuels which are particularly subject to auto-ignition by compression are not necessarily subject to fuel knock. This indicates that the spontaneous ignition theory of Ricardo, in its simplest form, is at least incomplete.

From the foregoing it may be concluded that whatever the phenomenon of fuel knock may involve, the observed facts are in reasonably close agreement with the theory that the high pressures and attendant phenomena are the result of an abnormal type of combustion which can be accounted for with a reasonable degree of completeness by the so-called detonation theory. The only serious discrepancy between this theory and the observed facts appears to be the failure to discover positions within the cylinder where maximum pressures and temperatures occur. If it can be assumed that the impact waves, which are taken as an explanation for the very high pressures, are capable of reflection within the combustion chamber, the hypothesis of localized maximum pressures is not essential to the theory.

Relative Merits of Large Slow-Speed and Small High-Speed Engines

For comparison one engine is assumed to have a piston displacement 50 per cent greater than that of the other. Rear-axle ratios are taken as 3 and 4.5 for the large and the small engine, respectively, in order that substantially the same torque can be delivered to the rear wheels in each case. Rather than inject a detailed analysis of the relation of friction losses to piston displacement, it is assumed that the increase in displacement is obtained by adding two cylinders to a four-cylinder engine and that the friction power is increased 50 per cent thereby.

A fuel consumption of 0.55 lb. per i.hp.-hr. has been used in the calculations for all conditions of engine speed and load. Tests made thus far at the Bureau of Standards indicate that the efficiency for a given load is independent of the speed over the range of speeds covered in this discussion. One further assumption, the relation of friction horsepower at part load to that at full load must precede the calculation of fuel consumption per brake horsepower-hour. An approximate relation, derived from tests on an automobile engine has been used for this purpose.

In calculating the fuel consumption in pounds per brake horsepower-hour, the first step is the determination of the brake horsepower developed at the speed selected. The brake horsepower developed at full load at that speed is also determined, and hence permits the percentage of full load at which the engine is operating to be deduced. Knowing this, the friction horsepower can be obtained by the relationship between the friction horsepower at full and part load, given in Fig. 5. Three steps remain: (*a*) the addition of the friction horsepower to the brake horsepower to obtain the indicated horsepower; (*b*) the division of the brake horsepower by the indicated horsepower to obtain the mechanical efficiency; (*c*) the multiplication of the fuel-consumption expressed in pounds per indicated horsepower-hour (0.55) by the mechanical efficiency, to obtain values of fuel consumption in pounds per brake horsepower-hour. Results calculated by this method are given in Fig. 5.

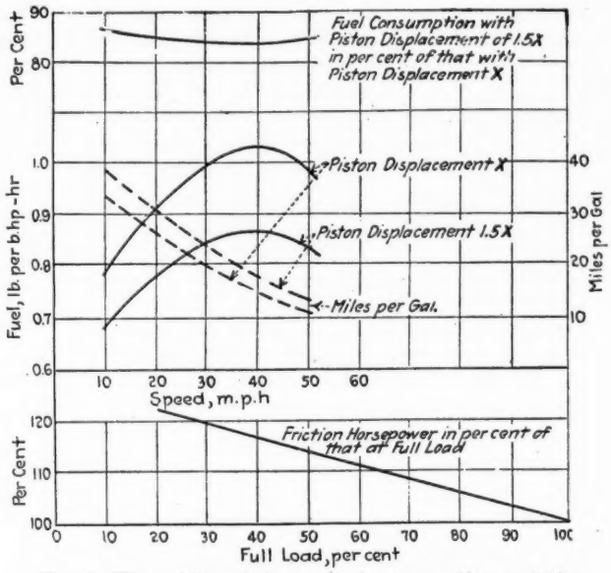


Fig. 5—The relation between fuel consumption and the friction horsepower at full and part loads

Percentage values, given in Fig. 5, show the larger engine to have a 15 per cent lower fuel consumption than the smaller engine. This figure is unfair to the small engine, as the increased weight of the large engine means that the ability of the car is reduced. Published data show that usually in a series of engines built by any one company, the weight per brake horsepower is less the greater the horsepower. Let this effect be neglected to take care of any weight increase in the transmission and drive required by the larger engine and let the increase in the engine weight be 50 per cent. As the engine-weight is about 15 per cent of the car weight, the weight of the latter will be increased 7.5 per cent. It is concluded, therefore, that the car has lost 7.5 per cent in ability and gained 15 per cent in economy. Furthermore, it is evident that increasing the large engine until its ability equals that of the small engine will still leave it somewhat superior from the standpoint of economy.

The foregoing analysis does not prove the superiority of either type of engine for every case. Engine cost, durability, relative ability for slow speed operation and many other factors must influence such a decision. There is a widespread belief that the small high-speed engine is vastly more efficient than the larger slow speed type. The purpose of this discussion is to challenge that belief and to show the factors of major importance in the comparison of the two types.

A PHOTOGRAPH of a California motorcycle hill climb contest was published recently in the British journal *Motorcycle*. This picture showed a rider, his machine almost turned over backward, in an attempt to climb a gradient of 1 in 2. The caption was "American Conception of a Hill Climb," and this comment was appended: "Such stunts are purely spectacular, and while exciting for the onlookers and riders, in no way help to advance design as do events in this country (England)." Here is a criticism worth considering both as regards motorcycles and automobiles.

Running Balance and Uniformity of Crankshaft Effort in 8-Cylinder 60 Degree Vee Engines

The vibrating forces in an eight cylinder Vee engine are dealt with by the analytical method in this article. One conclusion reached is that the maximum vibrating force of the 60 degree eight cylinder engine is only 61.2 per cent of that of a 90 degree eight cylinder Vee engine.

By P. M. Heldt

EIGHT-CYLINDER engines have been built in at least four different types so far, namely with the cylinders all in line and as 90, 60 and 45 degree Vee engines. The original eight-cylinder engines for aircraft and automobiles were 90 deg. Vee engines, and this type has enjoyed the greatest popularity up-to-date. Eight-cylinder all-in-line engines were first used—at least as far as automotive practice is concerned — by Charron, Girardot & Voigt in France in 1902 and revived by Ballot in 1919. The first Liberty aircraft engine was a 45 deg. eight-cylinder Vee engine, and recently the 60 degree Vee eight-cylinder engine has come to the fore by its adoption for use on the Lincoln and Wills-Sainte Claire cars.

There are two main objects aimed at when going to the complication of an engine with as many as eight cylinders, namely, balance of the reciprocating parts and uniformity of crank effort or torque. If the explosions come at equal intervals the crank effort will be the same no matter whether the cylinders are arranged vertically or in Vee form. But with 45 degree and 60 degree Vee eight-cylinder engines it is impossible to get evenly spaced explosions if the ordinary four-throw crank is to be used, which is necessary for the sake of compactness. It is reported that the 45 degree Vee Liberty engine showed a great deal of vibration. Theoretically there are no greater vibrating forces in a 45 degree than in a 90 degree Vee eight-cylinder engine, but the direction of these forces is entirely different. Whereas the direction of the vibrating forces is nearly vertical in the 45 degree engine, with only slight horizontal components, in the 90 degree engine these forces are absolutely horizontal, and it is conceivable that an airplane is much more sensitive to vibrating forces in a vertical plane than in a horizontal plane, owing to its much smaller vertical rigidity.

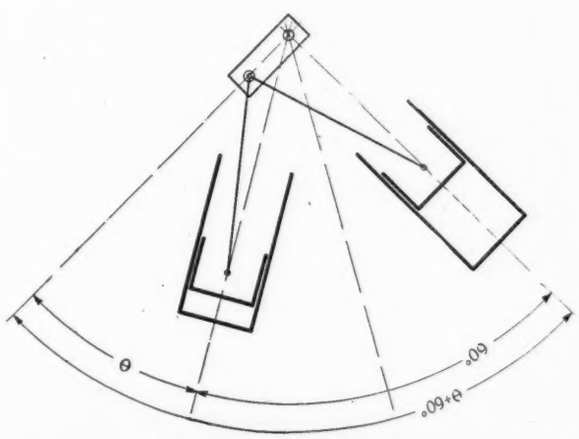


Fig. 1—Diagram of Vee engine

The writer first investigated the subject of vibrating forces in eight-cylinder Vee engines with different angles of Vee in an article printed in *The Horseless Age* of Feb. 1, 1916, and came to the conclusion that with a 60 degree angle of Vee the vibrating force is of constant value and uniformly rotating, the same as the vibrating force due to a rotating unbalanced weight. It rotates at twice the angular speed of the crankshaft and therefore cannot be balanced by weight rotating with the crankshaft. Its value is only about 61 per cent of the maximum value of the unbalanced force in a 90 degree eight-cylinder engine.

The method employed in the article referred to was partly analytical and partly graphical. It is, however, quite possible to deal with the problem by the analytical method alone. In doing this we can base our reasoning upon the fact that as far as balance of reciprocating parts is concerned the eight-cylinder Vee engine consists of two four-cylinder engines having a common crank axis and mounted at a certain angle relative to each other. We can obtain the instantaneous value of the vibrating force of the whole engine by combining corresponding vibrating forces of the two four-cylinder engines on the principle of the parallelogram of forces.

The vibrating force of a four-cylinder engine is

$$F_4 = \frac{2(0.0000142)\, W l N^2}{n} \cos 2\theta$$

where W is the weight of the reciprocating parts appertaining to one cylinder, in pounds; l, the length of stroke in inches; N, the number of revolutions per minute; n, the ratio of connecting rod length to length of stroke and θ the angle through which the crankshaft has turned from the top dead center position. We may write this in an abbreviated form as follows:

$$F_4 = \frac{2c}{n} \cos 2\theta$$

This is a harmonic force of twice the periodicity of the crankshaft revolutions, the so-called primary unbalanced force of the individual crank being entirely eliminated in the four-cylinder engine.

If we take the above expression as representing the un-

balanced force of the right hand set of cylinders in an eight-cylinder 60 degree Vee type engine rotating right-handedly, then the vibrating forces of the left hand set of cylinders can be expressed by

$$F_1 = \frac{2c}{n}\cos 2(\theta + 60 \text{ deg.})$$
$$= \frac{2c}{n}\cos(2\theta + 120 \text{ deg.})$$
$$= \frac{2c}{n}(\cos 2\theta \cos 120 \text{ deg.} - \sin 2\theta \sin 120 \text{ deg.})$$

We now have the instantaneous values of the vibrating forces for both sets of cylinders. These forces always act at an angle of 60 degrees to each other and the problem is to find their resultant.

In Fig. 2 the parallelogram of forces is shown, the diagonal c representing the resultant of the unbalanced forces due to the individual sets of four cylinders. We must now solve the problem of an oblique triangle of which two adjacent sides a and b and the included angle C are known, the value desired being that of c, the side opposite the known angle.

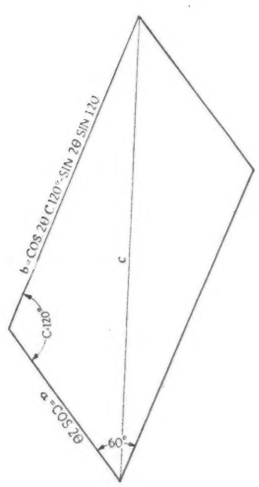


Fig. 2 — Parallelogram of vibrating forces in 60 deg. Vee engine

According to the rules of trigonometry, the value of c in terms of the other two sides and the included angle is:

$$c = \sqrt{a^2 + b^2 - 2ab\cos C}.$$

In our case

$$a = \frac{2c}{n}\cos 2\theta$$

$$b = \frac{2c}{n}(\cos 2\theta \cos 120 \text{ deg.} - \sin 2\theta \sin 120 \text{ deg.})$$

$$C = 180 \text{ deg.}$$

Since both a and b contain the factor $\frac{2c}{n}$, and there is a constant angle between them, c will also be proportional to $\frac{2c}{n}$, and we may therefore omit this factor in solving the triangle, thus making

$$a = \cos 2\theta$$

$b = \cos 2\theta \cos 120 \text{ deg.} - \sin 2\theta \sin 120 \text{ deg.}$

Substituting in the above equation for c—

$$c = \sqrt{\cos^2 2\theta + \cos^2\theta \cos^2 120 \text{ deg.} + \sin^2 2\theta \sin^2 120 \text{ deg.} - 2\cos 2\theta \cos 120 \text{ deg.} \sin 2\theta \sin 120 \text{ deg.} - 2\cos^2 2\theta \cos^2 120 \text{ deg.} + 2\cos 2\theta \sin 2\theta \cos 120 \text{ deg.} \sin 120 \text{ deg.}}$$

The fourth and sixth term cancel out, leaving

$$c = \sqrt{\cos^2 2\theta + \cos^2 2\theta \cos^2 120 \text{ deg.} + \sin^2 2\theta \sin^2 120 \text{ deg.} - 2\cos^2 2\theta \cos^2 120 \text{ deg.}}$$

Now, $\sin^2 120 \text{ deg.} = \frac{3}{4}$ and $\cos^2 120 \text{ deg.} = \frac{1}{4}$. Therefore,

$$c = \sqrt{\cos^2 2\theta + \frac{1}{4}\cos^2 2\theta + \frac{3}{4}\sin^2 2\theta - \frac{1}{2}\cos^2 2\theta}$$
$$= \sqrt{\frac{3}{4}(\cos^2 2\theta + \sin^2 2\theta}$$
$$= \sqrt{\frac{3}{4}} = 0.866$$

Therefore, the vibrating force of an eight-cylinder 60 deg. Vee engine is

$$F_{8\text{-}60} = 0.866 \times \frac{2c}{n}$$
$$= \frac{0.866 \times 2 \times 0.0000142\, W l N^2}{n}$$
$$= \frac{0.0000246\, W l N^2}{n}$$

This shows that the vibrating force is independent of the crank angle and has a constant value. Graphically it can be represented by a circle.

The vibrating force of a 90 degree eight-cylinder engine is

$$F_{8\text{-}90} = \frac{0.0000402\, W l N^2}{n}\cos 2\theta$$

and its maximum value is

$$F_{8\text{-}90} = \frac{0.0000402\, W l N^2}{n}$$

The maximum vibrating force of a 60 deg. eight-cylinder engine therefore is only 61.2 per cent of the maximum vibrating force of an eight-cylinder 90 deg. Vee engine. On the other hand the vibrating force of the 90 deg. engine acts in a horizontal plane only, where vibration is damped by the lateral rigidity of the chassis springs, whereas the

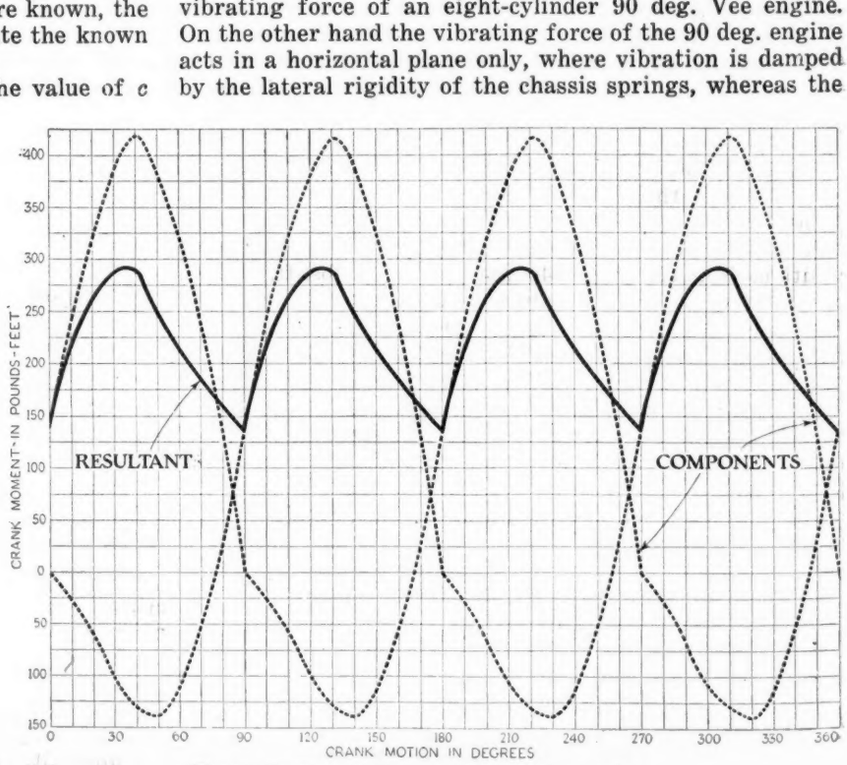


Fig. 3—Torque diagram of 90 deg. Vee engine

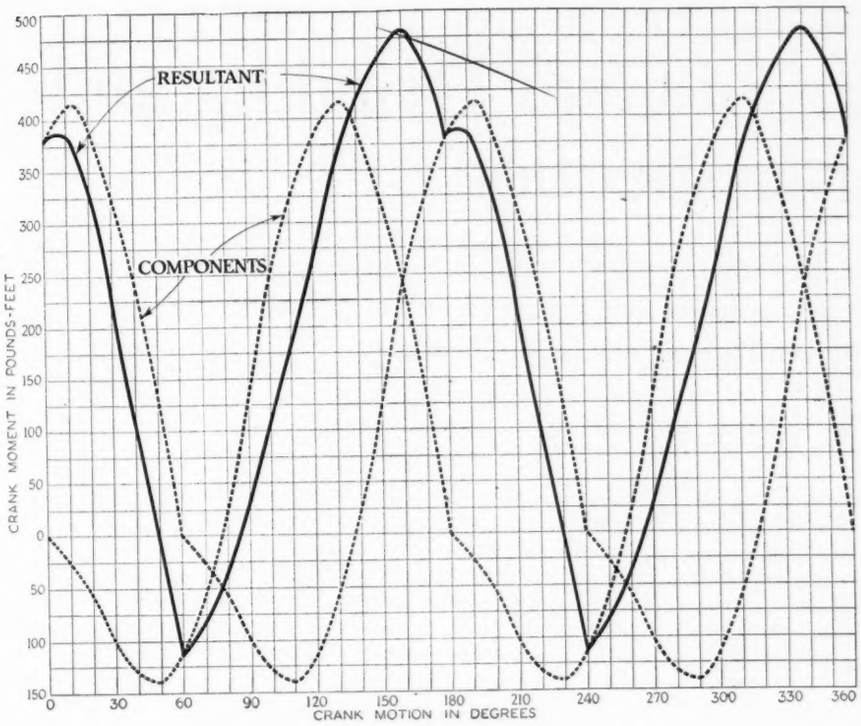


Fig. 4—Torque diagram of 60 deg. Vee engine

60 deg. engine tends to vibrate both vertically and horizontally.

In any eight-cylinder Vee engine using an ordinary four throw crankshaft there must be two explosions in every 180 degrees of crank motion, because that is the angular distance between successive explosions in cylinders of one block. In the 90 deg. Vee engine all explosions are evenly spaced and come at 90 deg. intervals. In the 60 deg. engine the explosions come at intervals of 60 deg. and 120 deg. respectively. In order to obtain a crank effort diagram we may take that of a four-cylinder engine and superpose upon it another one displaced 60 deg. with respect to the first for the 60 deg. engine, and 90 deg. for the 90 deg. engine; adding the two curves thus superposed in each case we get the crank effort diagrams of the 60 deg. and 90 deg. engines. These diagrams are shown in Figs. 3 and 4. It will be seen that the torque fluctuations are much greater in the case of the 60 deg. engine than in that of the 90 deg. engine. In the 60 deg. engine for the conditions assumed the torque varies between — 110 and plus 483 lbs.-ft. and in the 90 deg. engine for the same conditions between plus 140 and plus 290 lbs.-ft. The average torque is the same in both cases.

The maximum unbalanced force in an eight-cylinder 45 deg. Vee engine may be found in a way similar to that used above for the 60 deg. engine. In this case it is preferable to measure angles from the radial line midway between the axes of the two sets of cylinders. The unbalanced force of the right hand set of cylinders will then be

$$F_r = \frac{2c}{n}\cos 2\,(\theta + 22.5°)$$

$$= \frac{2c}{n}\cos\,(2\theta + 45°)$$

$$= \frac{2c}{n}\,(\cos 2\theta \cos 45° - \sin 2\theta \sin 45°)$$

$$= \frac{2c\,\sqrt{1/2}}{n}\,(\cos 2\theta - \sin 2\theta)$$

and that of the left hand set of cylinders

$$F_l = \frac{2c}{n} = \cos 2\,(\theta - 22.5°)$$

$$= \frac{2c\,\sqrt{1/2}}{n}\,(\cos 2\theta + \sin 2\theta)$$

In combining these two forces by the parallelogram of forces we may neglect the factors outside the parentheses, as they are the same for both sides of the triangle, and will therefore also appear in the third. We then have an oblique triangle of which two sides and the included angle are known, and the problem is to find the value of the side opposite the known angle, which is the resultant of the two component forces.

$a = \cos 2\theta - \sin 2\theta$

$b = \cos 2\theta + \sin 2\theta$

$c = 135°$

$$c = \sqrt{a^2 + b^2 - 2ab\cos C}$$

$$= \sqrt{2\cos^2 2\theta + 2\sin^2 2\theta - 2\,(\cos^2 2\theta - \sin^2 2\theta)\cos 135°}$$

$$= \sqrt{2 + 2\sqrt{1/2}\cos^2 2\theta - 2\sqrt{1/2}\sin^2 2\theta}$$

In order to determine for what value of θ this expression is a maximum we should differentiate it, place the first differential coefficient equal to zero and solve. It is obvious, however, that the expression reaches its maximum value when $\cos 2\theta = 1$ and $\sin 2\theta = 0$, that is when $2\theta = 0$ deg. For this case we have

$$c = \sqrt{2 + 2\sqrt{1/2}} = 1.848$$

Multiplying this by the factors which we neglected when finding the resultant of the two forces we get

$$\frac{2c\,\sqrt{1/2}}{n} \times 1.848 = \frac{2.613\,c}{n}$$

Further, since

$$c = 0.0000142\,W\,l\,N^2,$$

we have, finally, for the maximum force of unbalance of an eight-cylinder 45 deg. Vee engine

$$F_{s\text{-}45} = \frac{0.0000371\,W\,l\,N^2}{n}$$

Therefore the maximum unbalanced forces in eight-cylinder Vee engines with angles of Vee of 45, 60 and 90 degrees, bear to each other the relation of

371 : 246 : 402

This, however, does not mean that the amplitudes of vibration of the car will bear the same proportion to each other when engines of the different types are fitted, because these maximum vibrating forces act in different directions and the resistance of the chassis to vibration is different in different directions.

AT the plant of the Baush Machine Tool Co. worms for automobile drives are hardened by quenching after being heated in a cyanide bath. The worms have previously been carbonized, and the object in heating in cyanide is not to form a thin surface layer of carbonized metal as might be surmised, but to prevent decarbonization of the surface layer while being heated and the formation of a layer of oxide while the worm is being transferred to the quenching bath. The cyanide is contained in a pressed steel pot and has a low-pressure oil fire under it. There are two furnaces side by side, with a common chimney to carry off the combustion products.

A New System of Gear Grinding and Gear Inspection

Great accuracy of tooth and more rolling with less sliding action are claimed. Grinding machine works on generating principle and means for compensating for wear of grinding wheel is provided.

By P. M. Heldt

THE Maag system of gearing, due to Max Maag of Zurich, Switzerland, has been before the engineers of this country for some years. These gears are characterized by teeth of true involute form. In order to avoid interference in pinions with a small number of teeth, such pinions are made with a relatively small dedendum and large addendum, and the mating gears with a large dedendum and small addendum. In fact, the proportional dimensions of addendum and dedendum depend upon the gear ratio. In a pair of gears giving a large ratio there is a large difference between the addenda of the pinion and gear, while in a pair of gears for a 1-to-1 ratio, the addenda are equal, as are also the dedenda. Thus a pinion made by this process will run properly only with a gear of a certain number of teeth made by the same process. There is no definite pressure angle in this system, the angle varying somewhat with the point of contact along the tooth flank. It is claimed for the Maag form of tooth that with it there is more rolling and less sliding action than with other forms of gear teeth. Another advantage claimed is great accuracy of tooth outline, due to the fact that the teeth are formed on the generating principle by means of a rack-shaped cutter, the sides of whose teeth are straight lines.

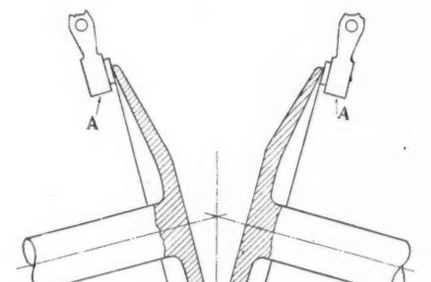
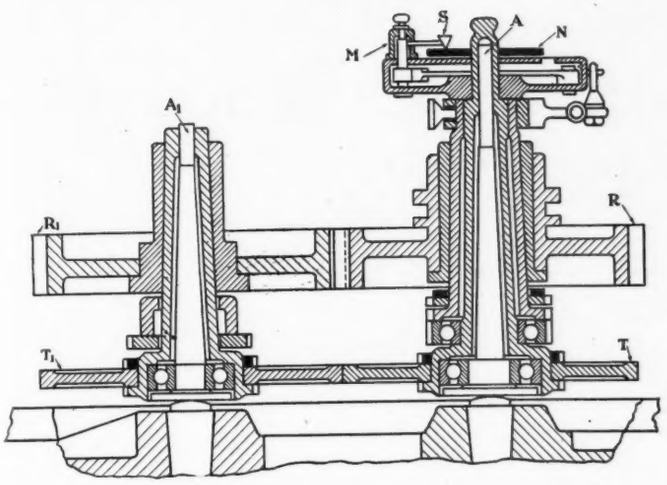


Fig. 1. Diagram showing the disked wheels used in Maag gear grinding machine.

Mr. Maag has recently developed a gear grinding machine embodying some novel features. This permits of making the gears of low carbon or alloy steel, case hardening them, and then, after hardening, correcting any distortion that may have occurred in the grinding machine. One of the difficulties in gear grinding in the past has been that, owing to wear of the cutting surfaces of the grinding wheel, the tooth spaces will gradually become narrower. The Maag gear grinding machine works on the generating principle, the same as the gear cutting machine. The grinding is performed by means of two saucer-shaped wheels which are set apart and inclined toward each other in such a way that the planes of the saucer lips coincide with the flanks of one tooth of the rack cutter if superposed upon same. The gear wheel to be ground is mounted on a horizontal axis and is fed longitudinally beneath the revolving grinding wheels. As it passes beneath the grinding wheels the gear wheel is reciprocated transversely through a short distance and at the same time is rocked through a corresponding angle, the two movements being correlated so as to exactly reproduce the movement of the gear wheel if it were rolled without slipping, on its pitch circle. A true rack and pinion action is thus obtained, the same as in the cutting machine, but in this case, as the rack has only one tooth, the work has to be indexed relative to the grinding wheel once for every tooth space. The arrangement shown in Fig. 1 is used for gear wheels above a certain minimum pitch. The tooth spaces of gears of small pitch are of insufficient width to permit of both grinding wheels working within them at the same time, and in that case adjacent spaces are ground simultaneously.

The interesting feature of the Maag grinding system is the means adopted for correcting for wear of the grinding wheels. It is stated that whatever wear takes place is evenly distributed over the cutting face of the grinding wheel, so that this face always remains plane and parallel to its original plane. The effect of wear is to reduce the width of tooth of the imaginary rack cutter and therefore to increase the thickness of the teeth being ground. The wear can therefore be compensated for by moving the grinding wheels apart, each parallel with itself.

The compensating mechanism consists of an electrically controlled mechanical device. For each grinding wheel there is a camshaft driven continuously at about 10 r.p.m. by belt and gearing from the motor driving the grinding wheel spindle. At each revolution the camshaft causes the lever A, Fig. 1, to oscillate on its pivot and to advance a diamond carried on its lower end toward the grinding wheel edge. If the movement of the lever is stopped by the edge of the grinding wheel at the correct point, nothing happens. But if the grinding lever has worn a certain amount the lever will swing far enough to establish an electrical contact. In this way an electric circuit is closed and the current flowing in this circuit is relayed to operate a clutch on a continuously driven shaft, from which, when the clutch is in, motion is transmitted through a pawl and ratchet wheel to a differential thread and thence to an adjusting screw on the grinding spindle bracket. By this means the bracket is moved until the grinding wheel lip plane is restored to its correct position. It is



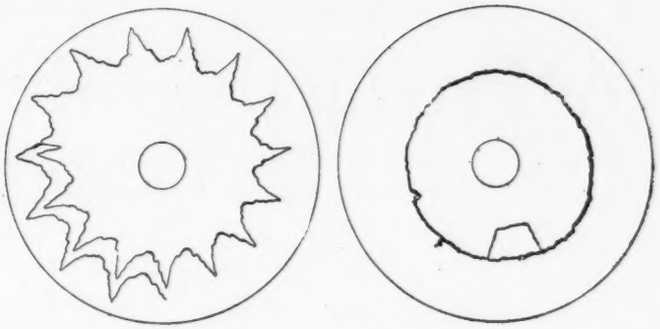


Fig. 3. Fig. 4.
Diagrams made by Saurer gear testing device.

F'g. 2. (Left) Saurer gear testing device used by Maag for gear inspection.

claimed that this adjusting mechanism is sufficiently sensitive to permit of an accuracy of the order of 0.001 mm. The mechanism, moreover, is said to be so trustworthy that it can be relied upon to keep the softest grinding wheel in adjustment. This allows of the use of relatively soft wheels, which, while wearing faster, cut more rapidly.

The adjusting mechanism is also used for setting new grinding wheels in the correct position. With the grinding spindle running, an electrical contact is made to bring the compensating mechanism into action. The adjusting screw then moves the spindle bracket until the wheel reaches its correct position, when the diamond carrying lever is forced back by the edge of the wheel sufficiently to break the contact and stop the motion. Electric current for the compensating mechanism is supplied by a two-cell storage battery.

Another interesting feature of the Maag gear grinding machine is the method by which the correct rolling motion of the gear during the grinding operation is obtained. The gear must, of course, be fed in an axial direction in order to grind the whole length of the teeth. Reliance is not placed upon a separate feed for the rolling motion, but, instead, rotary movement is imparted to the gear simultaneously with the axial movement by means of two steel ribbons, one end of which is fixed to the bed of the machine while the other is caused to unwind from or onto a segment secured to the work spindle and having a radius equal to that of the pitch circle of the gear being ground. Nine sizes of pitch blocks, covering the range of pitches in most common use, are supplied with the machine. Other pitches than those covered by these blocks can be cut by using the nearest size block and moving the stay carrying the fixed end of the ribbon by power at the requisite rate to give the difference of the motion.

For inspecting gears, Maag makes use of a very sensitive testing device developed by the firm of Adolph Saurer of Arbon, Switzerland (well known as truck manufacturers). A sectional view of this device is shown herewith. To determine possible inaccuracies of the gears the wheels R and R_1 are set on studs A and A_1 of the gear testing device and are slowly turned by hand. A friction wheel T_1, located upon stud A_1, is rigidly secured to wheel R_1, and carries along friction wheel T. The shaft of the latter is free to rotate in the wheel R, and is connected to the indicator disk N of a registering device M, the pencil S of which, through the intermediary of a system of levers, is connected to wheel R. If the teeth are cut perfectly, the pencil describes a smooth spiral line. But in case of defects the resulting tangential displacements between the absolutely uniformly rotating friction wheel T and the toothed wheel R are registered by the pencil on a scale enlarged about 200 times. By observing the wheel while turning, it is an easy matter to determine the location of defects and their nature.

The device can also be used in order to check the roundness and tooth clearance. By means of suitable bushings the wheels are placed upon the studs A and A_1, and with the hand wheel R and a scale they are set to the desired center distance. If now the two wheels are turned by hand, the feeler lever device, which is connected by means of links with A and A_1, shows how much the wheels deviate from cylindricity. Each division of the gage corresponds to a deviation of 0.01 mm.

If the hand deflections are repeated uniformly for each tooth, the fault lies with the tooth form. The clearance can be determined by multiplying the movement of the gage hand by twice the tangent of the pressure angle.

The two diagrams, Figs. 3 and 4, were made by means of this instrument. Fig. 3 is from a gear with inaccurate tooth form, which causes periodic fluctuations clearly shown by the diagram. Fig. 4 is from a gear with very accurate teeth. The sharp deflection of the indicator hand at one place is due to a human hair being placed between the teeth of the mating gears and the slight deflection at another point is due to a speck of dirt on one of the gears.

A Treatise on Gasoline and Other Motor Fuels

A VOLUME of some 700 pages entitled Gasoline and Other Motor Fuels by C. Ellis and J. V. Meigs, recently published contains much information of value to refiners and others interested in the chemistry, production, testing, mixing and use of liquid hydrocarbon fuels. More than twenty of the 27 chapters are devoted to description and comparison of cracking processes, but the remaining chapters deal at length with mixed fuels, fuel testing, refining methods and practice, benzol and alcohol as motor fuel, and shale as a source of motor fuel.

The authors of the book are chemists, and the volume naturally deals with the subject quite largely from the chemists' standpoint, though it contains much information bearing upon engineering and refinery practice and should prove of interest to automotive engineers who desire a knowledge of the characteristics of the various motor fuels, and the methods by which they are produced. The volume is well indexed and contains bibliographies of the subjects treated. The appendix contains much tabular information on the production and the physical and chemical characteristics of petroleum products. The book is published by the D. Van Nostrand Co.

A Production Manager's Solution of the Labor Problem

Production is largely dependent upon the men who operate the machines. A production manager recently outlined his practical ideas in an informal interview. His opinions show clearly how very closely related are low unit production cost and effective mental and physical workmanship.

By Norman G. Shidle

UNSTABILITY of employment is one of the biggest problems confronting American industry to-day, according to the general manager of an important automotive manufacturing plant. He believes, also, that the actions of employers at the present time in regard to their workmen will be of vast importance in determining the future trend and possibilities of industrial development. The plant operated by this executive employs several thousand men and is situated in a large urban district which was visited with the many labor troubles common to the war period.

The ideas on industrial relations held by this man are the result of many years of actual experience in production work. He holds his opinions regarding labor because, as he put it, "such methods pay a profit in better production and lowered costs." This indicates that he approaches the problem from a practical production standpoint and that he is not concerned with philanthropic motives. For this reason an outline of his methods and ideas should be of very practical value to other executives of the industry. This article summarizes an interesting conversation with this executive.

Unstability of employment is an extremely important problem, not only to the workman, but to the employer as well. Workmen are often blamed for holding back on production; for trying to avoid working themselves out of a job. It is easy to point out to the worker the bad economics of such procedure, but it is difficult to show him where his next week's wages are coming from.

The facts show that the workman has been urged to produce to his utmost one week and then been thrown out of work the next. It is not fair, and the best production cannot be expected from any man who is not certain as to whether or not his job will be good a week or two hence.

You ask me the question, "What is the solution to the problem of unstability of employment?" I don't know. I wish I did. The facts of the case are before us, however, and the vast importance of the problem must be recognized and all must aid in studying the matter.

The individual employer may mitigate conditions to some extent. We have tried to do that here. We have used every possible device to keep our old men at work. We have swung them from one kind of job to another. We have put them at work on a lathe one day and at pushing a truck the next. In this way we have kept as many at work as possible. A few of them didn't like being changed around at first. So I called them into my office here and talked to them. I told them why they were being shifted. I told them that I was striving in every way to keep them at work; to hold a job for them.

Then I pointed out the fact that when they got through being shifted around they were going to be bigger and better men. That in their particular case, the industrial depression was giving them a chance to learn more, to vary their experience, and to come through with a broader knowledge of the plant, its methods and organization. And what I told them is true. They will be better men—for themselves and for our organization. Even though a particular man on a particular day may not earn what we give him, he will earn it in the long run. Through this shifting around he will be worth more to us. We are making a virtue of necessity and will profit thereby in dollars and cents.

Better planning and more consideration for other organizations by our customers would help the situation a lot. And we are in the same position as many other plants. We make a large unit and are equipped to meet big production needs. Some of our customers do not think anything of sending us a telegram in the midst of a 500-a-week production telling us to stop production until further notice. Take a specific instance which has just occurred.

Two weeks ago one of our largest customers asked us to stop production for a week, and then to resume production last Monday. We laid off a number of men and told them to come back the beginning of this week. The men came back, but our customer changed his mind again and has delayed production indefinitely. We are running now simply on the hope that the customer will reinstate his order to go ahead within a few days.

We had promised those men work at that time. Had we not done so, they would have been free to look for other jobs. We had a real obligation to provide those men with work for at least a limited period after having made that promise. And we are making good. Had we failed to do so, we could not expect the workmen to believe us the next time we told them anything. The man that sends the telegram canceling orders usually considers the matter only from the financial standpoint. But he is having a direct permanent, as well as temporary, effect on the problem of human relationships in industry.

Better planning, better sales analysis and better scheduling of merchandising possibilities and probabilities will have a definite effect upon this big problem of unstability of employment.

Present Attitude to Labor

Right now is a very important time in the development of industrial relations. Labor was undoubtedly arrogant during the war; its newly acquired power went to its head, and in many cases workmen talked and acted in an unreasonable manner. Now the situation has changed. Many manufacturers are "taking it out" on their workers. There are plants within two blocks of here that are squeezing the blood out of their workers right now. Many others are taking this chance to get back at labor.

Any employer who adopts this policy of "taking it out" on his workers at this time is merely lowering himself to the level of the arrogant labor leaders whom he professes to despise so much and whom he says are unintelligent. He not only degrades himself in this way, but he lays up trouble for himself and his fellow employers in the future.

Even enlightened self-interest indicates that this is the time for the manufacturer to get the loyalty of his men, treat them fairly and gain their cooperation by exercising a justice of spirit and action that the labor leaders have not seemed able to understand. You don't have to treat labor right at this time, but for that very reason you will gain greater results by so doing.

The Individual Worker

Besides these general factors, however, there are important individual factors to be considered within every plant. The most important is that of making the man like his job. If I can get a man to like his job, I never have to worry about production. To accomplish this means attention to every individual worker. Many small factors of tangible and intangible character affect the situation in any given case. What these factors are and what is their relation to one another cannot be definitely stated. To discover them, however, constitutes another of the major problems before industrial managers.

Comfortable working conditions will help and should be provided in so far as possible. The psychological factors must also be considered. We had a department in which the men were laying down on the job because they felt that they would be out of a job as soon as the one was finished on which they were at work. We told them there was more work, but we couldn't convince them. I didn't blame them much, as most of them had been fooled elsewhere. Then I told the foreman to get the material for the next job and pile it up in the end of that department, where the men could actually see the advance work before them. He did this, although the new material wouldn't be needed for a week, and there was a definite increase in production the next day.

Then there is the matter of developing leaders. The foreman is, perhaps, the most important link in the management chain. I find that many men promoted from the ranks to foremanship cannot stand prosperity. Authority goes to their heads. I like to give a foreman as much authority as possible, but only in a few cases can much be given them, as the average foreman is likely to exceed his authority. Still it is the problem of the executive to train foremen for responsibility.

I happened to be going through the shop this morning, for instance, and I heard one of our foremen "bawling out" one of his workers at the top of his voice. He called him everything under the sun.

Just before you came in I had that foreman in here. I talked to him straight from the shoulder. I called him everything under the sun. He became angry. I meant that he should. Then I said, "You're sore, aren't you? But you had every bit of it coming to you. Don't you think Jones was sore out there this morning when you bawled him out before the whole department?

"The only reason he didn't step out and hit you between the eyes is that he was afraid he'd lose his job. He has a wife and several kiddies at home, and he doesn't dare take a chance on his job at this time. You made him lose his self-respect. Why don't you talk like that to other foremen? Because you know they wouldn't stand for it; they'd lay you out flat before you got half of it out of your mouth. You are simply a coward to talk that way to a workman whom you know can't hit back. This is your second offense, and there won't be any third. . . ."

And that is the only way to talk to a foreman of that kind. Workmen must be lead, not driven. Only in this way can they be expected to put that spirit into their job which produces the best quantity and quality results. Men who are driven can never be developed into leaders, and it is leaders that are greatly needed in our industrial organizations.

Too many men have a tendency to get into a rut and stay there. It has been my experience, which may not coincide with that of all others, that many men like to get on a single job and stay there. It is always a question, of course, whether the job dulls the man's mind and makes routine acceptable, or whether the mind was originally dull. Whichever may be the case, it is undoubtedly true that each job must be thoroughly understood if the best results are to be obtained from the worker.

An incident occurred here the other day which illustrates this point. There is one man whose task it is to hammer a rivet on a certain part of a body. He has been doing that job for several years. Recently the design was changed slightly in such a way that this rivet was placed one inch higher than previously.

It sounds almost absurd to say it, but that man found it almost impossible to adjust himself to striking that piece one inch higher. So mechanical had the operation become that he automatically struck the piece in the old place. The foreman kept close tab on him, but he continued spoiling piece after piece. Finally I went down and put under him a square piece of board one inch high. Standing on that board and striking as usual, he is now getting along all right.

These thoughts, expressed by a man skilled in production methods and experienced in handling men, are worth serious consideration. The incident just cited of the man striking a rivet illustrates the great lengths to which monotony work may go. It illustrates in a somewhat extreme manner the general tendency of all such work and indicates the tremendous problem which faces industry in this regard.

Such monotony jobs are multiplying rather than decreasing in industry. Their effect on the human mind is indicated by this example. It is inconceivable that means of remedying this situation shall not be found. Undoubtedly a long period of careful study and thoughtful experiment will be necessary. But the problem is the most important one which faces industry. And it is a problem of studying the individual worker.

Such individual studies far outrank in importance the more common investigations dealing with more general problems. The general studies are more usual, probably because they are easier to make, but the results obtained are not as permanent nor as useful. Practical production men are coming to recognize this fact more fully.

Government Data Helpful to Automobile Industry

At a recent meeting with a committee representing automobile manufacturers, Secretary Hoover indicated his desire to have the opinion of the industry as regards the figures which might be supplied by the Department of Commerce. The letter in this article answers that request.

RECENTLY a committee representing the automobile industry met with Secretary Hoover to discuss the gathering of data that would be of value to industry. Mr. Hoover said at that time that he was quite willing that the N. A. C. C. should be the chief agent in gathering statistics and that he had no desire to force figures from the industry. He also expressed a desire to know what figures might be compiled by his department that would be of value to the automobile industry. At Mr. Hoover's suggestion a list of such data has been prepared. This list is included in the following letter written to Secretary Hoover by Alfred Reeves, General Manager of the N. A. C. C.

AT the suggestion of Mr. J. Walter Drake, the chairman of the committee appointed by the National Automobile Chamber of Commerce to co-operate with you, we are specifying some of the data that the Department of Commerce might compile and that would prove most helpful to the motor vehicle manufacturers.

Trend of Business

In deciding on a correct production schedule, the manufacturer would be greatly aided by a report on general trend of business, which for the purposes of the motor vehicle maker, should include the following:

(A) Monthly pig iron production.
(B) Crop production in season compared with preceding years, with relative prices.
(C) Monthly advance orders on steel.
(D) Income tax statistics for latest preceding quarters, classified as to number of persons in various income groups in each State.
(E) Monthly railroad passengers and passenger-miles, also freight tonnage and freight ton-miles.
(F) Sales of packing-house products, shoes and textiles by months.
(G) Production, consumption and reserves of gasoline by months, compared with preceding years.

Much of the above material is separately available, but its consolidation in a single report would save individual labor and give a good index of general business conditions.

Car Uses

A report is now in course of preparation on the use of automobiles and trucks on farms and will be made part of the farm census. Similar investigation, but relating to economic uses of motor vehicles in other fields of work, would be most welcome.

Export Statistics

Manufacturers would be interested in export statistics of motor vehicles so classified as to differentiate between different priced passenger cars and motor trucks of different capacities.

At present these figures are grouped according to COMPLETE MOTOR VEHICLES and CHASSIS and specified by NUMBER and VALUE.

The classifications more suitable to the manufacturers in gauging their percentage of foreign trade should be as follows:

COMPLETE PASSENGER AUTOMOBILE OR CHASSIS

Costing up to $800 inclusive		From $801 to $1501		From $1501 to $2500		From $2501 to $3500		From $3500 up	
No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
..	..	..	..	..	..	..	..	..	..

COMPLETE MOTOR TRUCKS OR COMMERCIAL CHASSIS

Up to ¾ ton inclusive		From 1 to 1½ tons		From 2 to 3 tons		From 3½ to 5 tons		From 5½ tons and up	
No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
..	..	..	..	..	..	..	..	..	..

Foreign Production and Prices

Especially interesting to the American manufacturer would be definite data on the production, specifications and prices of cars made and sold abroad in competition with the U. S. product, also the number of workmen employed in the various foreign motor vehicle factories.

Re-Imported Cars

Because re-imported American automobiles and motor trucks have a direct bearing on the domestic as well as foreign markets, it would be helpful if the Department of Commerce were to issue monthly statistics on the extent of this trade. Two statistical groups would be sufficient for this purpose and would show the number of American passenger cars and motor trucks that were originally part of the U. S. war equipment, then sold to the Allied Governments, and are now being re-imported into the United States.

Uniform Statistics

It is desirable to have a uniform method of classifying statistics of motor vehicle exports from principal manufacturing nations. If England, France, Belgium and Switzerland could be induced to compile their monthly export statistics according to passenger cars and Commercial trucks and specify by number and value as is done by the other manufacturing nations, it would be easier to determine the world-wide movement in motor vehicle trade.

Promptness Essential

The value of these reports to the manufacturer depends solely on the promptness with which they are issued. Emphasis is put on this point in full realization that the Department of Commerce was inadequately supplied with funds necessary to carry out the work effectively.

The foregoing suggestions as to means in which the Department of Commerce can aid the automobile industry relate solely to statistical compilations. There are numerous other ways in which the Department can be helpful to our industry and concerning which we shall write later and thus avail ourselves of your courteous offer of co-operation.

Government Helps to Build 22,030 Miles of Highway

ON March 1 of this year 22,030 miles of highway, extending into every State, had been completed or were in process of construction, says the chief of the Bureau of Public Roads, United States Department of Agriculture, at a total estimated cost of $361,946,868. The percentage of this total estimated cost which will be incurred for each type, and the mileage of each type, based upon the records of plans approved, are as follows:

Per Cent and Mileage of Each Type of Road:

	Per cent of total estimated cost.	Mileage.
Type 1, including earth, sand, clay and gravel	32.2	15,300
Type 2, including water bound and bituminous macadam	9.0	1,530
Type 3, including brick, bituminous concrete, Portland cement concrete.	48.8	4,890
Miscellaneous	4.0	310
Bridges	6.0	...
	100.0	22,030

The states initiate the road projects, but before Federal aid is granted an engineer of the bureau makes an inspection of the roads to be improved, studies the local conditions, consults with the State highway department, and no projects are approved which are not considered suited to the conditions to be met. Many popular fallacies exist as to road improvement, and there have been many misconceptions as to the types of roads on which Federal aid funds may be used. Properly built earth roads, say specialists of the department, are the fundamental requirement in all highway improvement. Regardless of the material or type of surfacing which is to be placed, the preparation of the roadbed requires the highest engineering skill and experience. The department considers that the use of adequate sums for the securing of proper location, thorough drainage, permanent bridges and culverts and the elimination of railroad crossings is demanded if enduring improvements are to result.

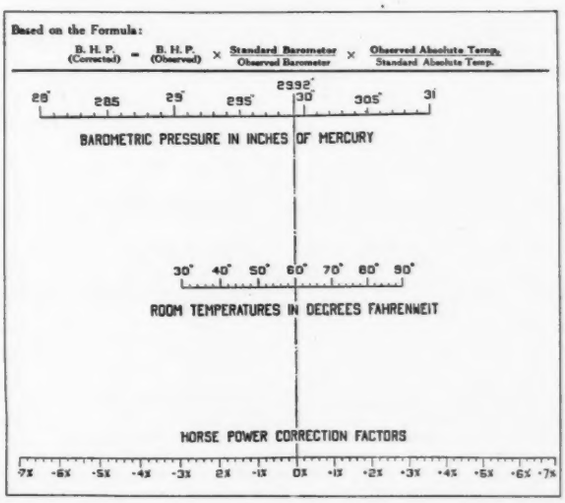
Federal aid is allotted to the improvement of earth roads, but only with the stipulation that a suitable surfacing will be placed as soon as funds become available. This allows the roadbed to be prepared and become thoroughly consolidated before the surfacing is placed, which is highly desirable from a construction viewpoint. To follow such a course, however, is out of the question when a road is heavily traveled and some form of surfacing must be provided. To care for traffic under these conditions, frequently a sand clay or gravel surfacing is provided, which will serve for several years and yet allow the road to be maintained under reasonably heavy traffic.

Horse Power Correction Alignment Chart

AN alignment chart designed to afford a ready means of determining the correction factor for bringing dynamometer test data to a common basis of air temperature and barometric pressure has been published by the Zenith Carburetor Co. This graph allows of a direct comparison between runs made under different atmospheric conditions. It is based upon the assumption that brake-horsepower at full throttle varies directly with the atmospheric density, and is computed from the formula which appears above the chart. The standard barometer is taken at 29.92 in. of mercury and the standard temperature at 60 deg. Fahr. The absolute zero of the temperature scale is taken at minus 459.5 deg. Fahr.

To use the chart, a straight edge is placed on the graduations of the barometric pressure and room temperature scales corresponding to the observed pressure and tempeature during the test. The point where this straight edge crosses the lower scale gives the correction factor in per cent, plus or minus. If the sign is plus, the correction should be added; if minus, it should be subtracted.

For example, for 29.80 inches of mercury barometric pressure and 46.0 deg. Fahr. temperature, the correction factor is minus 2.3 per cent. Assuming that the dynamometer balances at 108.7 lb., the correction is 2.3 per cent of 108.7, or 2.5 lb. Subtracting 2.5 from 108.7 gives 106.2 lb., the corrected pull. It should be noted that the correction factor is equally applicable to torque, brake horsepower and mean effective pressure.


Based on the Formula:
B. H. P. (Corrected) = B. H. P. (Observed) × Standard Barometer / Observed Barometer × Observed Absolute Temp. / Standard Absolute Temp.
28° 28.5 29° 29.5 29.92 30° 30.5 31
BAROMETRIC PRESSURE IN INCHES OF MERCURY
30° 40° 50° 60° 70° 80° 90°
ROOM TEMPERATURES IN DEGREES FAHRENHEIT
HORSE POWER CORRECTION FACTORS
7% 6% 5% 4% 3% 2% 1% 0% 1% 2% 3% 4% 5% 6% 7%

1—Zenith alignment chart for dynamometer, torque, and brake horsepower correction factors for standardization of engine test data.

Sales Charts Based on Average Life of a Vehicle

The charts presented here depict in graphic form the various points discussed in an article concerning the average life of cars published recently. The semi-logarithmic scale used in some of these graphs shows clearly both the actual and relative values of the various factors involved.

Charts by W. C. Marshall

TAKING into account all the factors involved, P. M. Heldt presented an analysis of the average life of cars and trucks in AUTOMOTIVE INDUSTRIES of March 17, 1921. That article took the yearly production, registration and export figures and with them as a basis computed the average life of cars and trucks during the last seven years.

Production figures were available from 1905, but registration figures were available only from 1912, when AUTOMOTIVE INDUSTRIES first began to compile them. With these figures as a basis, the average active life of a car was determined at 5.3 years.

This article proceeded purely upon the discussion method, the results being reasoned out and presented in logical sequence. There is a definite advantage, however, in bringing out these various points by graphic means to show more clearly the relation between the various factors and to form a basis for extending the ideas for future probabilities.

The accompanying charts fulfill this purpose. They were prepared by W. C. Marshall on the basis of the figures in Mr. Heldt's article. They show in an interesting way the comparative relationship between the various factors involved.

It is not necessary to go into a detailed discussion of the various charts since the individual purpose of each one is definitely stated in the caption. Some of the data is plotted on regular rectangular coordinate paper with regular spacing between the lines, while others are plotted on a semi-logarithmic scale.

This latter method has distinct advantages in showing relative gains or losses and in indicating the true relative

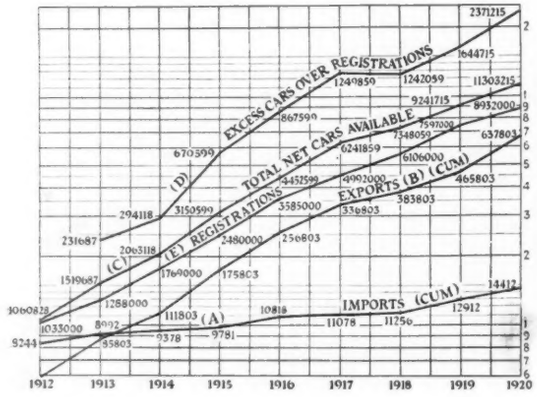
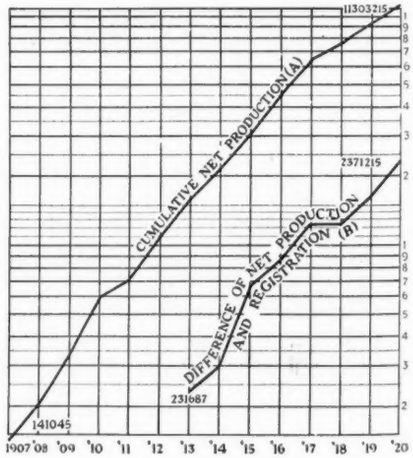


Chart 1 is a plot on semi-log paper of (A), the imports of cars beginning in 1912 with the total sum for the years 1906-1912 inclusive equal to 8244. The cumulative curve of exports beginning with 2200 in 1906 is shown by curve (B). The number 58,914 plotted for 1912 is the total number exported up to Dec. 31, 1912. The cumulative number to Dec. 31, 1920, is 637,803. Curve (C) is a cumulative curve of cars manufactured plus the imports minus the exports. This is called the net prod. The number 1,060,828 represents all the cars available in the U. S. up to and including 1912. The total at the close of 1920 is 11,303,215. Curve (E) shows the cars registered each year and is not cumulative. Curve (D) shows the excess total cars made over the registrations. This chart shows by the slope of the lines the percentage increase over that of the previous year. Parallel lines in different curves show the same rate of increase or decrease and can be readily compared.

Chart 2 (right) plot on semi-log paper of (A) the total production plus imports minus exports and is cumulative. Curve B shows the excess of cumulative available production plus imports minus exports, over registrations. By running back horizontally to curve A and measuring the intercept between the two curves A and B we find the average life of cars up to the year taken on the B curve and the year at the bottom of the chart below the intersection on the A curve which shows the date of manufacture of the oldest cars in service in the year taken on curve B



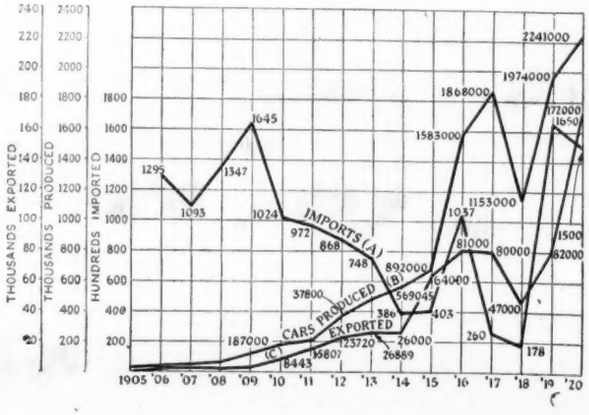


Chart 3 (left) shows fluctuations in yearly production, imports and exports from 1906 to 1920. This shows the marked decrease of imports in 1914 and 1915, 17 and 18, the increase in exports in 1920, and the increase in manufacture in 1917 and 19, as well as the slump in 1918. The last year of the war shows the most marked decrease in production, imports and exports, and the year following the greatest increase of all three

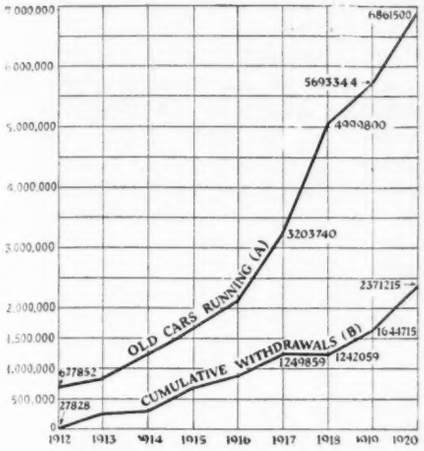


Chart 4—Curve A shows the old cars in service each year. The increase yearly is quite marked from 1916 to 1918, and drops off in the following years. Curve B shows the total number of cars withdrawn from service due to old age and storage causes. It is a cumulative curve. From 1919 to 1920 shows a marked increase in number over any preceding year.

value of the various sets of figures. It differs from the full logarithmic paper in that only the vertical coordinates are plotted logarithmically, while the horizontal coordinates are arithmetical.

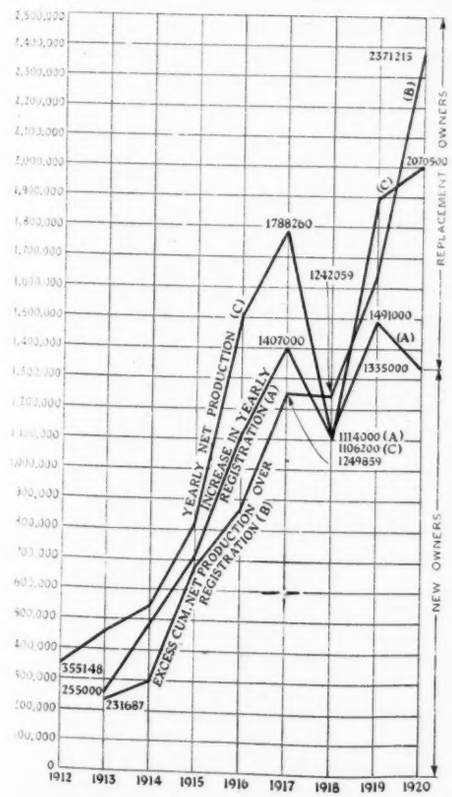


Chart 7—Curve A shows the variation in registration from year to year. Curve B shows how the total production of cars varied in excess of the registrations each year. As this excess is made up of new car owners and replacement owners, the increase in registrations is due to new car owners, and the difference shows the old cars which have been relegated to the scrap heap. The yearly production curve C shows the great falling off during the last year of the war, with resultant increase the following year.

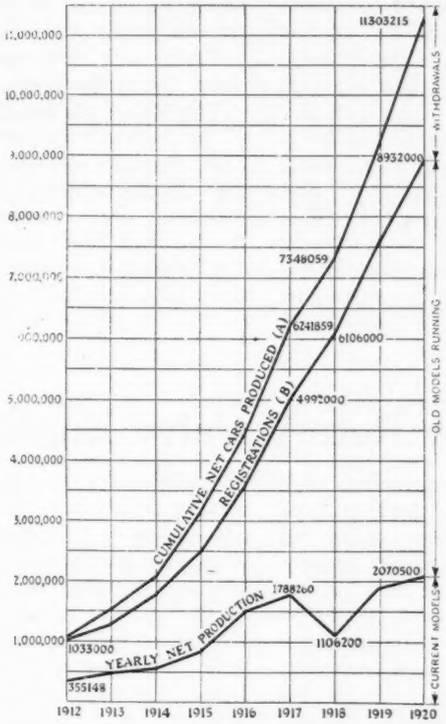


Chart 5 shows the cumulative net car production since automobiles were first manufactured and the B registrations each year from 1912. The difference between these curves each year shows the cars withdrawn from service that year. The net yearly production curve C shows how many of the registrations are new car owners. The difference between the registration B and yearly production curve C gives the old cars running.

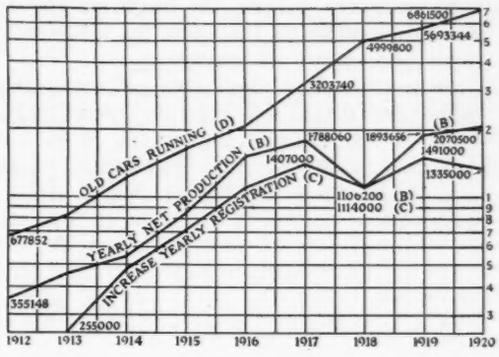


Chart 6—This chart is plotted on semi-log paper, the slope of the lines showing the percentage increase of each item. Curve D shows a pretty uniform per cent increase, except from 16 to 18, when it increased much more than any other period. At the same time the per cent of cars produced fell off as well as the percentage of registrations. These two decreases affected the use of old cars by causing the owners to use them a year longer than they ordinarily would. 1919 shows the per cent of old cars to have decreased and the per cent of production and registration to have risen again nearly to normal

An interesting discussion of the advantages of this semi-logarithmic method of charting is given by W. C. Brinton in his volume on "Graphic Methods for Presenting Facts." Part of this is worth quoting here:

"The principles involved," Brinton says, "are the same as those embodied in the slide rule. . . . No matter what the location of the chart, if the logarithmic spacing is used in the ver-

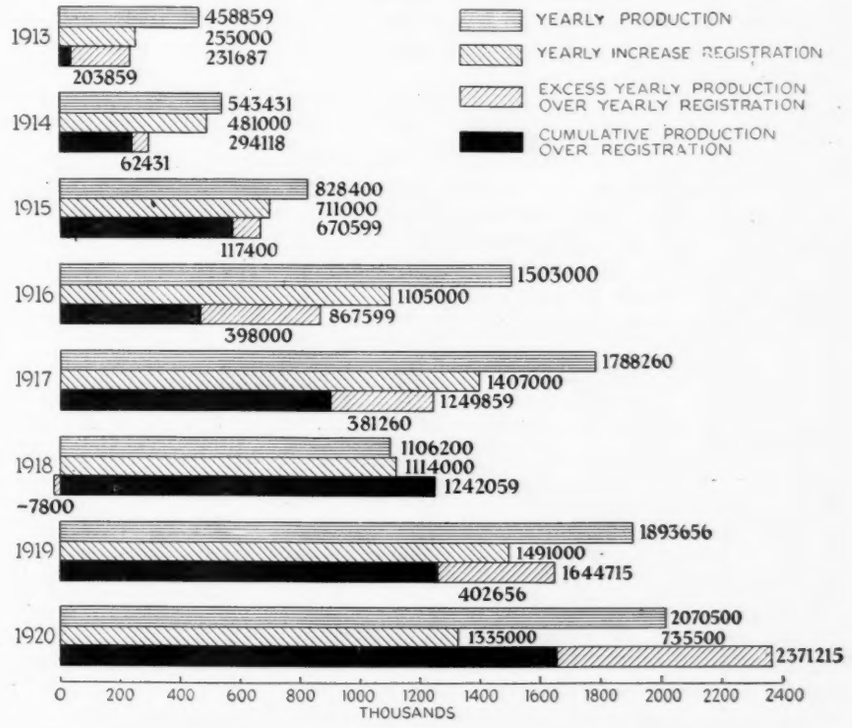


Chart 8 is a barograph showing the relation between yearly production, yearly increase in registrations, excess of production over registrations and total number of cars withdrawn since the period of automobiles began. The shaded portion at the end of the last-mentioned bar represents the number of cars withdrawn during that year. The standstill of the whole industry is brought out very plainly by the shortening of the bars during the year 1918, except the bar representing cumulative production over registrations and the number of cars withdrawn, which disappears entirely and even becomes a minus quantity, showing that all the old cars in storage and the ones barely able to run were gotten out and made to go through that year.

tical scale for curves, the angle of the upward or downward inclination is the same for all curves affected by the same percentage of change. . . . The logarithmic scale permits the exhibition of both actual and relative values and actual and relative fluctuations.

"It is unfortunate that there is so much difficulty in obtaining paper having logarithmic ruling in one direction and arithmetical ruling in the other direction. The arithmetical ruling is essential in statistical work, since we ordinarily must plot as one scale data representing years or other subdivisions of time. In statistical work we cannot well use a paper having logarithmic ruling in both directions, yet that is the only kind of logarithmic paper which can be obtained in most stores selling drawing materials and engineering supplies."

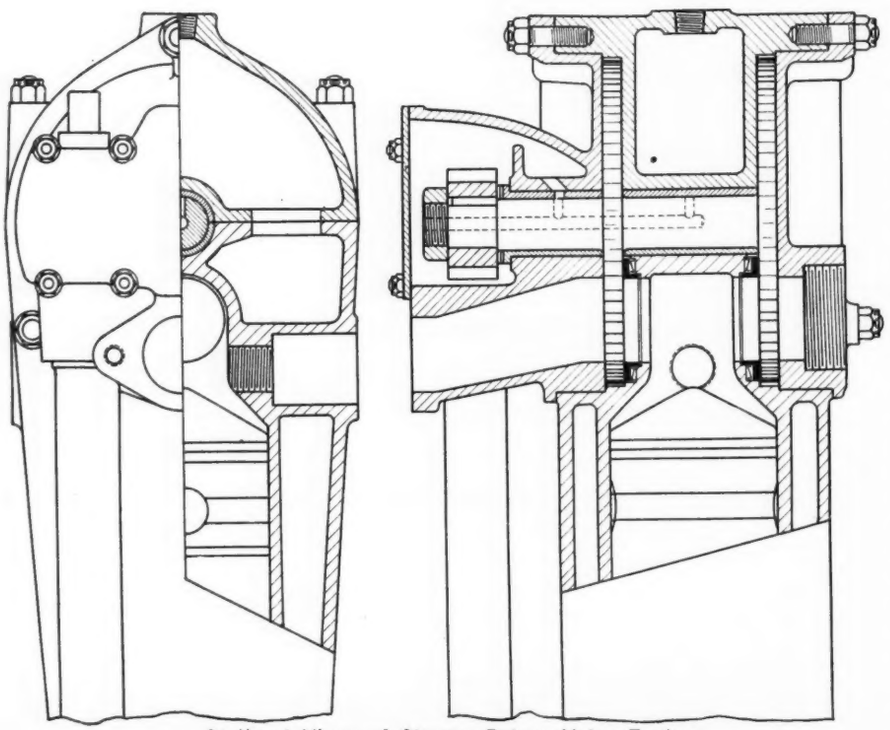
From this discussion it is evident that this sort of chart is particularly adapted to the material presented.

The value of the charts lies largely in the possibility of prejudging future trends on the basis of past performances as shown. Some such attempt was made in the charts recently shown prepared by the Commercial Research Department of the Franklin Automobile Co. A study of the charts shown here, however, will bring out certain different points, while future prediction can take into account current business and economic conditions as well as theoretical projection of the curves.

A New Rotary Valve Engine

A RATHER unusual type of rotary valve engine has been designed by H. P. Stevens. In order to develop some of the details of the valve mechanism in an experimental way, Mr. Stevens built a single cylinder upright engine, and two sectional views of the upper part of this engine are shown herewith. The compression space is in the head and is of inverted U-section with flat end walls which contain the inlet and exhaust ports. The valve functions are performed by two large diameter disks, both on the same shaft, the disks being located on opposite sides of the compression chamber. In order to get the two disks with their shaft into position, the upper part of the cylinder is split through the valve shaft axis. Each of the disks has a port cut in it, and when this port comes opposite the port in the compression chamber wall, intake or exhaust takes place. The valve shaft is rotated at uniform speed by means of a vertical shaft and helical gears, consequently, the valve mechanism is practically noiseless. The two valve disks are backed up by the circular end plates which contain the passages to which the inlet and exhaust pipes are secured and one of which also carries a bearing for the valve shaft.

The spark plug is screwed into the combustion chamber wall between the two valve disks. It proved a difficult problem to seal the disk valves, but a form of sealing ring is said to perform this function effectively. These rings are set into ring grooves in the valve seats surrounding the valve ports therein. Another important problem in connection with an engine of this kind is the lubrication of the valve mechanism. In the engine here shown this is effected entirely by pressure. In a four-cylinder engine with this valve construction it is necessary to cast the cylinder head separately and split it through the valve shaft axis.



Sectional Views of Stevens Rotary Valve Engines

Measuring Surface Tension

THE common method of determining surface tensions, by means of capillary tubes, is subject to the disadvantage that long capillary tubes of uniform bore are hard to find as well as to keep clean; besides, the meniscus is subject to cooling which has a strong effect on the surface tension. A new method which overcomes these difficulties was described in two papers recently presented to the Faraday Society by Allan Ferguson and P. E. Dowson of Manchester College of Technology.

Instead of measuring the rise of the liquid, Ferguson and Dowson force the liquid down to the lower end of the capillary, dipping vertically into the liquid, and they measure the pressure required for this in a suitable manometer. The liquid is placed in a beaker resting on a movable table. The capillary tube, which is dipped into the liquid, may be short; it is fused to another glass tube leading over to a mercury bottle; by raising this bottle the air in the glass tube forces the liquid, which had risen in the capillary, down to the edge of the tube at the point where the meniscus is formed.

The actual measurement is transferred to a U-tube gauge, branched off from the horizontal portion of the glass tube. Very concordant results have been obtained by this reversed method, and the fact, noticed by Ferguson, that benzol gave a surface tension of 29.6 dynes per centimeter when examined immediately after purification, but a higher value (29.9) after a day or so, testifies to the delicacy of the method.

Benzol is hydroscopic and increases its surface tension by absorbing water.

Manufacturing as Well as Statesmanship Subject to Impractical Idealism

The manufacturing organization should be thoroughly sold on the merits of the product, but it should temper its enthusiasm for perfection with an understanding of practical production methods and possibilities. Co-operation saves money. Some actual instances are related here.

By Norman G. Shidle

THE final success of an automobile concern rests upon the selling of its product. The real opinion of the car held by members of the manufacturing organization, however, is an important factor in contributing to that final success. Most manufacturers have realized the importance of this and the visitor to almost any automobile plant finds the entire organization thoroughly sold on its product. This is as it should be, but moderation is desirable.

Statesmen and writers have been accused by business men of "impractical idealism." There is such a thing as impractical idealism in the manufacture of automobiles as well. Enough is as good as a feast. It is well to imbue the manufacturing organization with the necessity for perfection, but care must be taken to provide that all the members of that organization recognize what is perfection and what is not; that they understand the practical limitations of manufacturing processes as well as the theoretical elements of automobile design.

An incident occurred recently in connection with a certain car that illustrates to some extent the dangers of an "over-sold" manufacturing organization. The body for a new model was designed. Presumably all the factors of body and chassis construction were carefully considered before the design was completed and the finished drawings were made ready for production. Much of this body was to be made of pressed metal and the construction of expensive dies was necessary.

The drawings were submitted and the dies made up by an outside concern. Production was about to begin, when the manufacturer decided on certain minor changes in body design. The expensive dies had to be altered. Production was started finally, but still further changes were desired by the manufacturer. Production was delayed and the expensive dies were altered again. Probably these changes in design were deemed necessary by the car manufacturer in his effort to make a car "just a little better" than that of any of his competitors. Yet the changes did cost money, and to some whose long experience might constitute them competent judges, they did not seem in keeping with the increased cost.

Another instance of similar nature occurred when a certain car manufacturer was equipping part of his product with disc wheels of a standard make. The inspection department of the car manufacturer complained continually concerning the quality of fit of certain bolts on the wheels. Finally the engineer of the wheel maker journeyed half way across the continent to the car manufacturer's plant. The inspection man objected that the bolts in question did not fit snugly and perfectly and desired certain changes in design.

The wheel engineer stated that this was the standard wheel that was being made in quantity and that any change in design would greatly increase the cost. He explained, moreover, that the bolts in question would fit properly when an inflated tire was placed on the wheel. The inspection man said they would not. The wheel engineer suggested that the experiment be tried to prove his statement. The inspection man said that it would be useless to do that since, the pressure of a tire would not force the bolts into their proper place and refused to make the experiment. He said that for this car the thing must be exactly perfect and that what might do for others would not do for them.

Just then one of the chief executives happened along. The wheel engineer explained the situation and again demanded that a test be made. The executive immediately acceded to his request. A tire was placed on the rim and pumped up with a hand pump. The bolts slipped neatly into their proper place and the wheel was shown to be perfectly constructed. Even then the inspection man objected that there was probably about 100 pounds pressure in the tire, which was more than the ordinary tire should carry. A pressure gage was applied, however, and showed the pressure to stand at 40 pounds.

Had it not been for the insistence of the wheel engineer, the entire shipment of wheels probably would have been rejected as defective and unfit for use. An organization, apparently green in the particular work, might have caused considerable trouble and expense to the company.

Other parts makers, as it happens, had similar experiences with this same organization. Pieces were rejected because of unimportant abrasions on unexposed surfaces, and for various other reasons, none of which had been discussed when the contract had originally been made. The result of such experiences is to generate some ill-feeling between the manufacturer and the parts maker and to increase the price which the manufacturer will have to pay for future orders of parts.

It is, of course, the undoubted right of the manufacturer to demand whatever quality of work he desires, but there is a practical limit to what can be expected for a reasonable cost. This cost can often be lowered without impairing an essential feature of quality if the co-operation of the parts makers is solicited and a fuller relation of confidence is established throughout the operations.

Moreover, it is obvious that as the degree of confidence between the manufacturer and the parts maker increases the many petty irritations and difficulties will diminish. As suspicion decreases, minor troubles di-

minish in proportion. A big truck manufacturer, for example, was telling recently of the men which his organization maintained during peak production times in the plants of various parts makers. These men were there as inspectors and in some cases almost as directors on the manufacture of the parts. Every care had to be taken that defective material was not used and that the parts were up to standard.

"We also had a lot of parts made by the Blank Company," the manufacturer continued. "No," in answer to a question, "We didn't have a man there. We didn't need to. We have done a lot of business with them, we know them and they know us well, and we know that we can depend upon them to do the job in every way as well as it can be done."

Money can be saved by an increase in confidence and co-operation. Every manufacturer knows that it costs him more money per unit to deal with certain firms than with others even though the quoted price on the article be the same. Sometimes this is the fault of the parts firm. Sometimes, however, it is the fault of the manufacturer. The interdependency of the various units of modern industry makes co-operation a paying proposition and a practical necessity.

Restoration of Worn Machine Parts

A NEW process for building up worn machine parts, known as the Fescol process, is described in *Engineering*. The worn part is built up by depositing on it a coating of nickel of suitable thickness, and the treatment employed is said to give a coating so adherent that it is practically impossible to remove it from the core by any ordinary means. The process is due to R. J. Fletcher of London and has been in use for more than a year.

Parts such as crankshafts, spindles, axles, pistons and similar objects, which have been reduced in diameter or rendered oval by wear, can be made perfectly serviceable by depositing the nickel where necessary, keyways, screws and other parts on which the deposit is not required, being protected as will be explained later. Motor-car engine cylinders which have been scored by the wrist pin, and lathe leading screws badly worn in the working portion, are other examples of repairs satisfactorily effected by the process at a small fraction of the cost of replacement.

The metal deposited has good wearing properties, its Brinell hardness number, as determined by tests at the National Physical Laboratory, being about 360 when coated to a thickness of 0.04 in. on a steel with a hardness number of 298. The corresponding figure for the hardness of a mild steel having an ultimate tensile stress of 32 tons per square inch would be 150. The adhesion of the nickel coating is remarkable, a longitudinal pull of 11.95 tons having been found necessary to shear a ring of nickel 0.215 in. wide from the surface of a steel cylinder 1 in. in diameter, on which it had been deposited. These figures, which were also obtained from a test at the National Physical Laboratory, indicate that the adhesion amounted to 17.6 tons per square inch of adhering surface.

In working the process, the article to be treated is first placed in an alkaline electrolytic bath, in which all traces of grease are removed, and, after rinsing and drying, it is dipped bodily into a bath of molten wax. The wax, which rapidly cools when the article is lifted out of the bath, is then removed from those parts on which the deposit is required and left adhering to the other parts. The article is next placed for a few minutes in an acid electrolytic bath which removes any metallic oxides from the exposed surfaces, renders them chemically clean, and also brings them to a suitable molecular state to receive and retain the deposit. This acid bath is an essential part of the process, and is that to which the exceptional adherence is due. The nickel depositing bath, to which the article is then transferred, is of the usual composition, and is worked at a temperature of about 85 deg. F. The current density used is about 15 amperes per square foot, and, at this density, nickel is deposited at the rate of about 0.001 in. per hour, so that if a deposit ⅛ in. in thickness is required the article must remain in the bath for over five days. This slow rate of deposition is, perhaps, a drawback, but it could probably be improved by raising the temperature of the bath and also by agitating the objects while the deposition is proceeding.

Summary Concerning the Motorcycle and Bicycle Industry in 1919

A PRELIMINARY statement of the general results of the 1919 census of manufacturers with reference to the motorcycle and bicycle industry has been issued by the Bureau of the Census, Department of Commerce. It consists of a detailed statement of the quantities and values of the various products manufactured, prepared under the direction of Eugene F. Hartley, Chief Statistician for Manufactures.

Reports were received from 51 establishments engaged in the industry during 1919, with a total value of products of $53,105,995. At the census of 1914 there were 78 establishments with products valued at $22,234,262. Of special interest is the increase in the production of bicycles, the number reported in 1919 being 470,675, as compared with 299,029 in 1914, an increase of over 57 per cent.

In 1919, 9 establishments were located in Ohio, 8 in Massachusetts, 7 each in Illinois and New York, 5 each in Indiana and Wisconsin, 4 in Pennsylvania, 3 in Connecticut, 2 in Michigan, and 1 in Washington.

The statistics for 1919 and 1914 are summarized in the following statement. These figures are preliminary and subject to such change and correction as may be necessary from a further examination of the original reports.

COMPARATIVE SUMMARY OF STATISTICS FOR THE MOTORCYCLE AND BICYCLE INDUSTRY, 1919 AND 1914

	1919	1914
Number of establishments	51	78
Value of products[1]	$53,105,995	$22,234,262
Motorcycles:		
Number	59,214	62,154
Value	$16,176,055	$12,161,775
Bicycles:		
Number	470,675	299,029
Value	$12,277,341	$3,757,318
Tricycles, value	$625,522	$6,315,169
Motorcycle parts, including delivery and side car attach.	$10,646,480	
Bicycle and tricycle parts	$4,814,668	
All other products, including repair work	$8,565,929	

[1]In addition, in 1919, motorcycles and bicycles, including parts, to the value of $2,205,743 were produced by establishments engaged primarily in the manufacture of other products; in 1914, to the value of $4,647,798 by establishments of a similar character.

Four-Wheel Brakes Not Too Severe

Editor, AUTOMOTIVE INDUSTRIES:

I have been reading with a great deal of interest your various articles regarding the use of four-wheel brakes abroad, and have noticed in your issue of June 16 some letters on the subject from prominent American automotive engineers.

The first letter from W. R. Strickland, chief engineer of the Peerless Motor Co., headed "The Disadvantages of Four-Wheel Brakes," convinces me that Mr. Strickland has had no experience with a car on which the four-wheel brakes are properly designed. He states that it is very uncomfortable for the passengers when the car is suddenly stopped.

With the Delage, which is, of course, the only car I know anything about, I claim that there is a great deal less discomfort in short stopping than would be possible with any car having two wheel brakes only. As a matter of fact, there is practically no tendency to throw passengers forward.

We have demonstrated with one car upward of 24,000 miles. The original brake lining is still on the brakes and, as you probably know, were there any weaknesses in this braking system they would have developed long since. I can assure you that these brakes have been subjected to a great deal more strain than would be the case under normal conditions, and yet I claim we can stop this car in unusually short distances with a great deal less discomfort to the passenger than is possible under any other braking system.

A. A. ROST, President,
Delage Concessionaires (U. S. A.), Inc.

Factors Affecting Fuel Economy

Editor, AUTOMOTIVE INDUSTRIES:

The paper entitled Elements of Automobile Fuel Economy, by W. S. James, read at the summer meeting of the S.A.E., was so comprehensive in its nature that some of the salient points are likely to become absorbed without full appreciation. The average user perhaps does not realize that an expenditure of power, and consequently of fuel, is necessitated in order to drive a car on a bumpy road in excess of that required for a smooth road. The magnitude of the excess can be measured by the power required to accelerate vertically the mass of the unsprung weight and some proportion of the sprung weight, the number and distance of the accelerations per unit time being determined by the nature of the road surface. I have found that loss of speed of the car in a horizontal direction accompanied an increase in the number and amplitude of vertical motions imparted to the body of the car. By fitting suitable springing devices the energy previously expended wastefully was turned to good account.

Does not much of the fuel wastage in every day life result from driving cars and their occupants vertically as well as horizontally? I am sure of it. We have tables of road resistance such as are reproduced in Mr. James' valuable paper, but we would also like to have some definite data as to the effects of different types of springing upon fuel consumption.

I have measured the power expended upon propelling the various parts of the car body at different speeds and the resulting cost of using a wind screen, etc., in cents per mile.

These costs vary very considerably not only from moment to moment but from day to day.

Tests of one car I have made on the track show at 30 m.p.h. and different weather conditions a variation in resistance to car motion from 125 to 180 lb. For this reason it becomes difficult to make accurate deductions based upon road or track measurements, though they are sometimes helpful.

I cannot too strongly deprecate, as I have always done, the practice of some engineers of placing horsepower output on a pedestal and treating all other considerations as of minor importance. How often has the fact been pointed out that the maximum power is seldom if ever used, and that seldom is the test bench performance attained in ordinary usage due to many causes which need not be gone into here? Mr. James and Mr. Nelson have helped forward the argument in favor of giving a better consideration to the actual requirements in service. A great deal of time and effort is expended upon futile argument or upon the third place of decimals while there remain with us major problems the solution of which would help forward the objects of economy to a much greater extent.

If fuel were not so cheap, engineers and others would be more careful about how it was used.

R. W. A. BREWER.

Metal-to-Metal Clutch Lubrication

Editor, AUTOMOTIVE INDUSTRIES:

I have read with interest Mr. Chase's article on American and British practice in clutch design.

He is, however, in error when he states that clutches of the type shown in Fig. 18 as used on the Vauxhall car must needs be run in oil. The Vauxhall clutch has been in successful use since 1910, the only lubricant used being powdered graphite. For this reason the somewhat formidable list of disadvantages of this type of clutch presented by Mr. Chase. do not exist.

An additional advantage of the metal-to-metal disk clutch is that no provision need be made for adjustments of the clutch spring pressure, and as the total wear after prolonged use is negligible, there is also no necessity for providing any adjustment for the position of the clutch pedal itself.

LAWRENCE H. POMEROY.

The reference to the Vauxhall clutch as being one which runs in oil is evidently in error. It is true, however, that metal-to-metal clutches require lubrication, graphite being used in place of oil in this case, with consequent reduction in the coefficient of friction. For this reason a greater number of plates is required as compared to fabric-faced disks to carry a given torque with a given spring pressure and size of disk. The cost and the spinning weight are therefore higher, hence the metal-to-metal type is not without disadvantages. Some other makes of metal-to-metal clutches use oil for lubrication, and are subject to the other disadvantages cited in the paper referred to.—EDITOR.

Determining a Better Basis for Wage Payments

The American Federation of Labor has asked its executive council to attempt to determine a sound basis of wage adjustments. Service rendered by individual is only logical basis, but practical application must come slowly. Manufacturers should take up this problem.

By Harry Tipper

THE convention of the American Federation of Labor has brought forward many interesting matters for the man who desires information on the general ideas of the labor leaders prominent in that body.

The importance of the presidential honor in this organization is indicated by the fight which took place for a change in the situation. The character of the politics in labor organizations is indicated by the character of the campaigning and some of the statements that have been made regarding the support of the candidates.

The political character of these organizations is very definitely indicated in the suggestions of resolutions, in the actions of the various committees and in the attempt being made to have the American Federation of Labor lend the strength of its endorsement to proposed legislative matters, matters of international policy and matters of general political character.

For the industrial executive, however, the most important items are those dealing with the policy of the American Federation in regard to industrial matters.

> **One of these marks a departure from the usual program of this organization and is interesting because of its admission that the present system is not satisfactory. This refers to the method of fixing wages, and calls upon the executive council to investigate the manner in which wages are fixed with a view to getting a better basis than the cost of living for determining wage scales.**
>
> **"Fixing wages by the cost of living," the executive council report said, "brings death through a perpetuation of a static condition." The object of this investigation is stated to be the discovery of "a sounder basis for our social life as a whole." Unfortunately, the American Federation of Labor is committed to uniform scales of wages, and the general tendency of the movement of trade unionism is toward uniformity all through the occupation, irrespective of local conditions.**

The statement has been made in these articles that the cost of living is not a sound basis for the consideration of wages, and to this extent the investigation of the Executive Council of the American Federation is justified in its proposed examination. It is hard to see any possibility of a sounder method of adjusting wages, with the tendency definitely developed toward uniformity along these lines. There is evidence of an incomplete examination of the situation in the statement that wages are fixed on the cost of living, because this is not entirely true.

Wages have been fixed by the available "supply and demand," and, while they have a general tendency to agree with the reasonable requirements to maintain life, the particular wages in any occupation have been the wages which the manufacturer was obliged to pay, either because of the relation between supply and demand, or because of the power of the organized forces among the workers in that industry.

However, the fact that the American Federation of Labor is to conduct an investigation into wage systems with the idea of suggesting a sounder basis is quite important. It indicates the existence of general dissatisfaction among the leaders, not only with wages, but with the methods of computing wages.

> **Whether the conclusions arrived at are of importance or not, the investigation itself will undoubtedly suggest matters that will be of advantage to the industrial leader in his study of the wage question. Of course, the only logical basis for wages is the service rendered by the individual, and the relation between that service and the social advantage. There is no hope of any practical application of this logical ideal in the immediate future, and any adjustments of the wage system must be based upon the present methods of determining wages and the present general relations between the different occupations and industries.**

The fabric of industry would not be able to withstand any severe change in its general methods of development. It can be improved only by the change in one detail after another, so that the machinery will continue to function through all the changes that must be made.

The investigation proposed by the American Federation of Labor will be affected by the practical necessities of the case. It is not likely that conclusions reached will depart materially from present practices, and for this reason any suggestions can be weighed more easily.

The practical ability of the labor leader to sense developments as they become visible is indicated again in this proposed investigation of wage systems. Manufacturers have been aware of the unsatisfactory character of wage adjustments and the necessity for better methods of determining wage scales. No investigations of importance have been made by professional organizations or manufacturers' associations.

It is evident that new considerations must be given to wage systems and methods of wage adjustment. These studies must take into account the elements affecting the efficiency of the individual worker and the extent to which they are related to the wage system. The elimination of the fluctuations in the efficiency of the indi-

vidual, the increase in the individual efficiency and the decrease in the waste must be measured in connection with any examination of wage systems looking to suggested changes.

It is unfortunate that professional societies and manufacturers' associations have done nothing along these lines, because investigations from this side will be necessary before any practical advance can be made in the wage systems themselves.

To be effective the reward should be based upon the service, it should satisfy the sense of justice, increase the incentive for improvement and develop confidence in the future. The reward must suggest safety in the permanence of the work and the removal of economic fear. Any moves that are made to change the wage systems in these directions will have a beneficial effect upon industry and upon the relations between management and labor.

It is interesting that the representatives of labor should have seen the necessity for this investigation before the representatives of capital and management have indicated their desire to improve things along this line, particularly as the examination of all factors is necessary to any just conclusions.

Industry would be well served if the leaders in professional and manufacturers' organizations, and the leaders of labor opinion could contribute their influence to an impartial investigation so that all the elements of inefficiency could be determined, the practical limitations in the systems examined and the possibilities of improvement considered.

The present investigation proposed by the American Federation of Labor will be limited by the traditions and precedents of that organization, and any of its conclusions will be discounted and discredited among manufacturers because of the source from which these conclusions come.

A great deal of progress could be made if the leaders in the professional and manufacturing groups would religiously study all suggestions for improvement, no matter where they came from, including particularly the investigations to be carried out under this resolution, by the executive council.

Despite the difficulties in the case and the probable limitations of the investigation, this proposed examination of the wage systems is likely to be the most important development from the present convention of the American Federation of Labor.

Classes of Research

PROF. LEONARD BAIRSTOW, speaking recently before the National Union of Scientific Workers, distinguished between scientific research, applied research, and experiments and tests. The three branches naturally merge into one another; yet Mr. Bairstow's main definitions will be accepted. Scientific research had, at the time it was carried out, no industrial bearing at all, he considered. A long period might elapse between the work of a Faraday or Maxwell and the stages of financial benefit. Scientific research needed an atmosphere of complete freedom from the anxieties of making both ends meet; the freedom implied communication of ideas with friends, unrestricted by national boundaries. Secrecy was extremely undesirable. Applied research had at the outset a definite industrial bearing owing to the difficulties of manufacturing processes. The work was allotted to research associations, to private laboratories and to Government departments; whether or not it should be secret was a controversial point. With certain safeguards the conduct of applied research could be materially helped by committees. The work, if worthy of the name, was slow and hazardous, and required co-ordination. By experiments and tests, Mr. Bairstow indicated the work necessary to meet a specific order after it had been placed. That work was of little general value, it was unsuitable for committees, and generally considered was confidential and urgent. For the routine tests of finished products, private institutions were better suited than highly-developed laboratories. Very special tests justified a certain number of central government laboratories empowered to issue certificates, but their range should be very carefully circumscribed. "If experiments and test work be carried out by a staff also allotted to applied research, the latter will suffer and tend to become extinct under existing systems of administration."

Speaking from his own experience, Professor Bairstow pointed out that applied research had difficulties in keeping alive in an establishment which used the same staff for experiments and tests. The latter were urgent, research was slow. The tendency was to push extra-experiment in ahead of research until the postponement of research was indefinitely prolonged. In order to keep research alive staff and apparatus should be specially provided for it. Further, the administrator responsible for finance had an additional temptation to favor tests which produced fees. A capable committee could here do much. If, however, the terms of reference of the committee covered both tests and research, the temptation to secure immediate results might prove too strong. That argument against intermingling applied research and experiments in the same establishment might also be made in the case of universities, though it carried less force there.

AN interesting opinion on motorcycle racing was expressed recently by the British journal, *The Motor Cycle*. Since it applies here, as well as abroad, the opinion is worth quoting:

"Does racing improve the breed? Undoubtedly; provided that the means by which races are won can be rendered applicable to touring machines without detriment to reliability or comfort. Such events as the Tourist Trophy and many of the long-distance races at Brooklands have done much to improve the cooling, reliability and general efficiency of the touring motorcycle; but what of the short-distance records? Let it be understood that we have no intention of disparaging the fine performances which have been accomplished over short distances. On the contrary, these phenomenal speeds are most interesting and instructive, and are productive of new ideals and new standards of performance. At the same time, it is evident that some of these records are of little immediate advantage to the average motorcyclist, since they are incapable of being sustained for any useful period. Provided the manufacturer of the record-breaking machine sets to work to incorporate the lessons he has learned in his touring mounts, well and good; but if he merely concentrates on obtaining an extra mile per hour on the track but little progress will be made."

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Planning

IT sometimes seems as though manufacturers do not sufficiently recognize the importance of the old adage, "Be sure your right, then go ahead." Automotive manufacturers cannot be criticized for neglecting the latter part of the admonition, but expensive design changes, made after dies have been constructed, indicate that the "be-sure-you're-right" part is not always appreciated.

To draw a design, submit it to the parts maker, allow him to construct expensive dies and begin production is an expensive but legitimate part of manufacturing. To make frequent changes in that design after production has started is not fair either to the parts maker or the public. Such changes are sometimes rather arbitrary in character. They result in men being thrown out of employment, human hardships, production losses, increased costs and increased selling prices.

All of these things are to the detriment of industrial progress in general as well as to the manufacturer himself. Careful planning and a greater degree of co-operation by all men, companies and departments concerned will aid greatly in reducing or eliminating such unnecessary troubles and costs.

Heat Treatment Here Saves Trouble Hereafter

TWO cases have recently come to our notice in which failure to properly heat treat engine parts during the process of manufacture has lead to serious difficulty when the part has been placed in service with the result that articles possessing real merit have been blacklisted and will long be condemned as worthless, whereas a little intelligent forethought and care in development would have enabled the makers to benefit through recognition of intrinsic value of their product.

The first case is the aluminum piston. Many of the failures registered by pistons of this material were unquestionably due to failure to heat treat the piston prior to the final machining operation. As a result the pistons were put into service with casting strains unrelieved. Under the influence of heat in the engine the casting strains were relieved, the piston warped and much trouble resulted. To avoid this excessive clearances were sometimes allowed. Had the casting strains been relieved by heat treatment during the manufacture, the effect of distortion could have been canceled by later machining.

The second instance has to do with the tungsten steel valve. Some, at least, of the manufacturers who made these valves reasoned as follows: why bother to heat treat an exhaust valve when it is immediately subjected to high temperature when put in service? So many such valves were produced without heat treatment and placed in service. Forthwith they warped, for the internal strains had not been relieved and were quickly destroyed or rendered unfit for service until refaced. Obviously the warping should have been brought about by proper heat treatment before the final machining operation in production. Failure to do this has resulted in prejudice against the tungsten valve, though valves of this alloy possess considerable inherent merit and perform well in service when properly made.

Similar conditions apply in the manufacture of other parts subjected to heat or sometimes only to vibration during service, and should be borne in mind by the manufacturer if he desires satisfactory service from his product. Particulars of interest in this connection are given in the article by Dr. Rosenhain on Problems and Possibilities of the Aluminum Piston, which appeared in the recent Engineering Number of AUTOMOTIVE INDUSTRIES.

Recognizing Essential Factors

"WHEN employers have thoroughly defeated and broken the union organizations — if such a thing is possible—they will be far from a solution of the labor problem. The essential factors involved in human relationships lie much deeper and are much more complex than the mere battle between

employers' associations and union organizations." This is the opinion of a superintendent in charge of an open-shop plant employing more than one thousand men.

Similar opinions are being expressed by other far-seeing executives in various parts of the industry. The purpose of a labor policy is to get better quantity and quality production through the gaining of co-operation and enthusiastic work from the men. The purpose is not to win a victory or fight a battle to satisfy the employers' pride. In the long run it will be necessary to get the workers to go along with the management of their own free will. Hard times will not last forever, and the man whose only incentive is fear of unemployment is not the best workman at any time.

There is a certain manufacturers' association which meets every year and which devotes one session at each meeting to a discussion of the labor problem. These labor discussions are very private; no stenographic notes are taken, and the papers read are not published. The entire discussion at these sessions centers around the various methods of fighting the unions, the use of "scabs" during strikes, and many other practical defensive and offensive tactics of industrial warfare. To judge from the chief speakers' ideas, the millennium will have arrived when all unions and union leaders have been strung up to lamp-posts. When hard times frighten labor into temporary submission, a note of jubilation is sounded and progress is predicted. When times are good and labor comes into its own, there is weeping and wailing and gnashing of teeth.

The attitude and tenor of discussion of this manufacturers' association is still reflected too strongly in certain parts of industry. Permanent progress toward solving labor difficulties rests in a study of the individual, the various factors influencing his life and work, and achievement lies along the lines of careful study and thoughtful experimentation.

Needless Waste of Lubricants

A MARK of careless design or assembly is the pool of oil left on the garage floor or roadway by many cars even though they be new and presumably in good repair. A floor pan is required in many cases to prevent the floor of the show room from becoming stained, while our highways are black with oil dropped from cars and trucks which use them. A dollar a gallon is, one would think, a rather high price to pay for road oil, yet that is about what the average motorist pays for oil, a large proportion of which is ultimately deposited on the roadways wherever cars are used.

This would be bad enough, simply because it represents a waste which is in large part preventable, were lubricating oils cheap and the natural supply unlimited, but when the price of good oil is high and the supply decidedly limited the waste is not to be condoned, especially when there are many ways of minimizing if not eliminating the waste; such as thrower rings and flanges, felt washers, return threads, proper gaskets, better inclosure, with return ducts for oil, etc.

It is rightly considered a mark of poor design, construction or repair to see oil leaking from any machine in a well-kept shop or power plant. The mere fact that in the modern car the oil leak is hidden is no excuse for continuing a design known to be defective in this regard. This is a subject that may well receive more study on the part of the engineering, production and service departments of all producers of automotive equipment.

"Seek and Ye Shall Find"

HAVING once taken a certain side of an argument, it is a common human trait to maintain the justice of that side through thick and thin. Sometimes this takes the form of trying merely to prove that the other side is wrong. Frequently the desire to win the argument becomes so strong and the struggle of wits and resources so interesting that the actual purpose of the struggle is forgotten in the mix-up.

The relations between manufacturers and employees have arrived at this stage in many instances. Abuses on both sides have had the effect of emphasizing the struggle and obscuring its purpose. It is easy to point out the many faults of organized labor; it is easy to cite numerous individual instances in which the attitude and actions of the worker have been unfair. To do this merely proves that the way out suggested by organized labor is not feasible.

In reply to these criticisms, labor leaders oppose similar statements which show the unfairness of employers. Both sides have been rather successful in convincing their own groups. But the fundamental aim of each group seems to be to win the argument with the other.

Fundamentally, that is not the problem at all. The chief aim is to produce permanently harmonious industrial relations. This end can be achieved through seeking for truth, for basically correct facts, and for sound interpretation of those facts. So long as both sides seek and interpret facts with the idea of simply proving their side of the argument little progress can be made.

In his recent address to the S. A. E., President Beecroft quoted Rene Descartes, the French philosopher, as follows; the thought expressed applies equally well to the attitude necessary in considering industrial relationships:

". . . there is nothing so far removed from us as to be beyond our reach, or so hidden that we cannot discover it, provided only we abstain from accepting the false for the true and always preserve in our own thoughts the order necessary for the deduction of one truth from the other."

To realize this ideal fully in our mental processes may be impossible, but to approach the problem of human relationships with that thought in mind will make for practical progress; for more study and less propaganda; for more analysis and less argument. In this field, especially, we are still uncertain as regards the fundamental facts upon which to base extensive action. The time is ripe for a period of analysis and experimentation.

Banker Urges Price Stabilization

Big Market Waiting Final Adjustments

Gotham Bank President Says Makers Should Assure Present Price Values

NEW YORK, June 28—Henry H. Bizallion, president of the Gotham National Bank, which handles the accounts of more automobile dealers than all the other banks of New York combined, has written a letter to Alfred Reeves, general manager of the National Automobile Chamber of Commerce, suggesting that a marked advance could be made in the stabilization of the industry if car manufacturers would give assurances that present prices are excellent values and that no more changes are to be expected unless they are upward. He asserts that a survey made by the bank indicates that there is substantial purchasing power available for motor cars, but that buyers are waiting for the final adjustment of prices.

Reeves has asked members of the N. A. C. C. to comment on the suggestions made by Bizallion, whose letter follows:

"June 25, 1921.

"Dear Sir—As we handle more automobile merchants' accounts than all other banks in New York combined, we are deeply interested in the continued prosperity of the retail automobile business. This interest is very direct in that many of these dealers have been our customers for the past ten years.

Glad Adjustments Orderly

"Price adjustments in the automobile business, the same as in other lines of industry, were inevitable, and we are very glad to see that these adjustments came in much more orderly fashion than they did in other industries. According to your price lists all the readjustments seem to have been accomplished except for a few announcements that I understand will be made around July 1. The object of this letter is to learn whether you have any assurance from manufacturers that all price readjustments shall be made by July 1, so that the public will realize that the new prices are to continue over a substantial period.

"Would it not be well to suggest to all manufacturers that while no guarantee may be necessary, it would seem highly important to the prosperity of the retail trade that manufacturers endeavor to prove to the public that the present prices are excellent values, that in some cases they are made at a substantial but necessary loss during the readjustment period, and that for these reasons no further changes may be expected unless they are upward?

"During the past few years the banking fraternity has been led to look upon the automobile industry with the greatest respect, not alone because of its volume, but because of the energetic manner in which it has been conducted and our high appreciation that cars and trucks are now permanent necessities in our American life. Banks generally have been liberal with their credits to the industry, curtailment coming only in a few districts and in a few cases where the dealer was not entitled to credit, irrespective of the product he was selling.

No Loss on Dealer Business

"We take pride in the fact that in ten years of financing automobile dealers to the extent of many millions of dollars, we have never had a dollar's loss, except in one instance where fraud was committed.

"Our interest in the retail selling field has led us to make a survey, which shows:

"1. That there is a substantial purchasing power available for motor cars in particular, and to some degree for motor trucks, particularly in connection with new building operations that are now getting under way.

"2. Buyers generally are waiting for the final adjustment of motor car prices, to be assured that when they do buy the price will not change a few weeks later.

"3. It is the hope among dealers that all manufacturers who contemplate price adjustments will do so promptly and with the full understanding of the requirements of the next six or eight months.

"4. While guaranteeing prices may have many bad features, the makers should endeavor to impress the public with the new values in motor cars and

(*Continued on page* 1450)

British Car Makers in Market for Parts

LONDON, June 10 (By mail)—The Rover Co. of Coventry has established a precedent for British automobile makers by advertising in the newspapers for bids on practically all materials used in the manufacture of its 8 hp. light car. Hitherto the practice in the British automobile trade has been to invite a selected list of firms to bid. In some cases this does not insure competitive prices. The conditions require ability to quote close prices and guarantee delivery. There are intimations that American companies might find it to their advantage to compete for the reason that since the war British manufacturers have found themselves up against combinations in the castings and stampings trade.

Mexican Peace Big in Car Opportunity

Distributer Predicts Tripled Sales With Continuance of Present Normal Conditions

NEW YORK, June 27—The number of automobiles in Mexico to-day will be tripled or quadrupled within the next two or three years in the event that peaceful conditions continue throughout the Republic. This statement was made here to-day by F. G. Canton, the distributor in Mexico City of the Cole, Oakland and Cunningham cars and Brockway trucks.

The greatest drawback to increased use of automotive equipment in that country has been the danger in driving outside of Mexico City, Guadalajara, Tampico and a few of the other cities. Conditions have changed so materially in recent months, Canton stated, that this fear is being overcome and, when all parts of the Republic are again open for motor traffic, a great gain in the number of cars is expected because, as Canton added, Mexico has need of the transportation facilities offered by the automobile.

Road construction and highway improvement during the last six or seven months has been greater than during any similar period for many years. Practically all of the streets in the capital have been put in good repair and the highway activities outside of Mexico City have been large.

Canton is one of the backers of the new Association of Mexican Automobile Importers which was recently formed in Mexico City and numbers the principal firms engaged in automotive trade. The association has mapped out a big program for the next few years and it is expected that co-operative effort will enable the dealers of that city to overcome many of the present business difficulties.

WORCESTER BUYS STENMAN

WORCESTER, MASS., June 28—The Worcester Electric Tool Corp. has taken over the business formerly conducted by the Stenman Electric Valve Grinder Co., Inc., the Stenman Electric Tool Co. and the Consolidated Machine Tool Co., all of Worcester. The Worcester Electric Tool Corp., which was organized to take over the three concerns, is headed by H. P. Gleason. A. G. Sandberg is treasurer, J. J. Kelleher is sales manager and Harold Paine, advertising and service manager. The principal products which will be featured for the present is the Hus-kee service tools and drills.

Tractors Prove Superior to Horses

Fargo Farmers Get Impressive Lesson

Heat Forces Three Teams Out—One Machine Disabled—Attendance Small

FARGO, N. D., June 28—Forty tractor outfits and ten horse outfits started at 8 o'clock this morning in the first national tractor demonstration in this country in which a fair amount of work will be done by each. There is a ten-acre plot each tractor must plow and seed. It will take a tractor pulling three plows approximately ten hours to do the work and some with six plows expected to finish in half a day.

The ten-horse outfits were not entered by the Horse Association as tractor makers hoped would be done, but it was necessary for tractor makers to scurry around and get horse entries. Officials of the Horse Association refused to be drawn into a contest in which tractor makers drew up the rules without consulting with them.

The horse outfits belong to local farmers who, in most cases, are going to fare well, as some tractor makers are presenting them with machinery, such as plows, harrows and other tools used, in addition to approximately $1,000 cash prizes. It is questionable if any comparative results of horse and tractor efforts will be given the authority they should carry.

Only 26 different makes of tractors are competing, as compared with upwards of 70 makes at former demonstrations, the condition of the times being responsible for the reduced numbers. The most important makers are present except Samson and Moline. Among those competing are Fordson, Cletrac, Case, Wallis, Avery, International Harvester, Bates, Twin City, Emerson-Brantingham, Allis-Chalmers, Best, Deer, Huber, Gray, Hart-Parr, Aultman-Taylor, Holt, Rumely, Lauson, Nilson, Titan, Townsend, Rock Island, Fox, Liberty-Eagle and Grain Belt. The French cultivator, Souma, which takes the place of a plow will perform.

There is a growing feeling that the demonstration will not provide as good cost figures at it was hoped. The amount of fuel used and the time required will be obtained, but many of the factors entering into cost cannot be considered. Each tractor must be handled by one man, instead of a group of men, as at some former demonstrations, and the tractor operator must handle the plow without any outside help. Repairs on the tractor must be made by the operator. The ground to be plowed is dead level and is a black gumbo, covered knee high with weeds. Some trouble is expected in plowing it five inches deep, as required.

The very hot weather caused three of the horse outfits competing to withdraw before the first day was over.

The tractors competing gave a good performance, all starting at 8 a.m. and working on the hardest soil ever plowed in a national demonstration. Only one machine was disqualified for breakage. This was a Titan which had a defective driving gear that could not be repaired in the 30 minutes allowed for such work.

The three plow tractors finished their 10 acres in less than 10 hours and compared with the six horse team which pulled only two plows and did not plow half as much, they gave a good lesson to the farmers on the great economy in motor equipment.

The attendance was very small and even worse than last year. The novelty of the tractor has passed and whereas two years ago several hundred spectators followed the Fordson and other popular makes across the fields, scarcely half a dozen showed such interest today. Unless the attendance picks up in the last two days of the demonstration it scarcely can be regarded as a success, considering the cost.

Dakota farmers are not yet ready to buy. It will be July 20 before the status of the present crop is known definitely and farmers intend to wait.

N. A. C. C. Truck Survey Shows Farms Big Market

NEW YORK, June 28—The truck committee of the National Automobile Chamber of Commerce has completed its survey of motor trucks in use on farms in the states of Rhode Island, Maryland and Pennsylvania. The data shows that in Pennsylvania on 186,863 farms, only 12,631 trucks are in use and that there are only 11 counties in which there is no need for more trucks. Smaller sizes are preferred. In Maryland there are only 2817 farmers who use trucks. Most of them are of the 1-ton variety. It is evident that motor vehicles are popular in Rhode Island, because 1350 of them are in use on 3500 farms in Providence and Newport counties. It is stated that additional trucks are needed in Providence County.

DENY STINNES FIAT PURCHASE

NEW YORK, June 28—Reports from Turin, Italy, state that officials of the Fiat company deny that Hugo Stinnes, the German industrial magnate, has purchased a large block of Fiat stock. It is admitted that negotiations for the purchase of this stock were in progress, but are said to have been abandoned.

Congress to Impose High Aluminum Duty

Will Increase Tariff from Two to Five Cents Per Pound on Crude

WASHINGTON, June 27—It appears that the appeal of the National Automobile Chamber of Commerce to the House Committee on Ways and Means for low duties on aluminum products has been unavailing. It is stated in authoritative sources here that the permanent tariff, which the committee will report out by July 5, will carry a duty of 5 cents per pound on aluminum, aluminum scrap and alloys. The N. A. C. C. has asked that paragraph 143, under section 3, be left unchanged, or preferably, taken out entirely, as the present duty is 2 cents per pound. It was contended that the manufacturers of automobiles would use more aluminum if the price could be reduced by lower tariff rates.

Under the Payne-Aldrich Act, the duty on this material was 7 cents per pound, and in the Underwood-Simmons Act, 2 cents. Aluminum plates, sheets, bars, strips and rods were said to have been given a duty of 9 cents, as compared with 11 cents carried in the Payne-Aldrich Act and 3½ cents in the Underwood-Simmons law. The Ways and Means Committee was recently informed that the total production of aluminum in the United States is about 200,000,000 lb. per year, of which the automobile industry consumes approximately 100,000,000 lb., or 60 per cent.

It was charged that the Aluminum Co. of America owns and controls more than 90 per cent of the bauxites in the United States suitable for the manufacture of aluminum, and that it produces approximately 80 per cent and consumes about 90 per cent of all the aluminum in the United States. It was pointed out that if the duty is increased the foreign manufacturer will hardly be able to compete because of the additional custom charges when, with the margin at 2 cents, duty is already exceedingly small.

QUALITY TIRE MAKES OFFER

ANDERSON, IND., June 27—Stockholders of the Quality Tire & Rubber Co. have voted in favor of a proposal that the company issue bonds to the amount of $600,000 and that present stockholders take $100,000 of the issue. Creditors will be expected to take the remainder of the bonds to satisfy their claims and the subscription of the stockholders will be used as operating capital. The liabilities approximate $500,000.

Parts Business Slow Despite Car Sales

Heavy Retail Buying Not Yet Reflected in Orders from Manufacturers

NEW YORK, June 28—Notwithstanding the almost phenomenal sales of motor cars at retail in most sections of the country, the excellent trade of distributers has not been reflected fully in the business of parts and accessory makers. This would seem to indicate that numerous car manufacturers had on hand a considerable number of surplus cars when they suspended, in a large measure, the buying of materials late in May.

The business of parts makers is exceedingly spotty. Some of them are keeping fully abreast of their May business while others report there has been a sharp falling off in orders. Most of them have two or three motor car companies which are good customers, but are getting little business from others which previously have been on their books. It is probable, however, that the latter half of June will show a greater volume of business than the first half.

Reports from Detroit and other cities are to the effect that some parts plants which had contemplated a shutdown at the beginning of July, ostensibly for inventory purposes, will continue operations through the month, although on a reduced scale. Many of the car makers have found it necessary to increase their schedules to meet the demand for cars resulting from increased sales due to price reductions and this ultimately will reach back to the men who supply them.

It is certain that the slowing up of the industry in July will not be so marked as was expected a month ago. Underlying conditions are thoroughly sound and there is reason to believe that after the middle of September there will be a steady upward trend.

Credit conditions, especially in the smaller cities, are not entirely satisfactory. While the banks have more cash available than for many months, they are loaning it with the utmost caution and many manufacturers are having considerable difficulty in obtaining funds with which to finance the orders they are receiving. There is a tendency on the part of many bankers to send their surplus funds to New York.

Parts makers generally, however, report collections for June better than for any month this year. There has been a continued whittling down of past-due accounts.

New Orders to Keep Timken Plant Operating

DETROIT, June 29—Decision to close the Timken Detroit factory for a month July 1 has been altered as the result of orders coming in steadily, which will necessitate operation of the plant on the present basis of 1/3 normal for the next 60 days at least, according to General Manager Fred Glover. Orders are coming through every day, said Glover, and though in small volume are sufficient to keep the factory working.

The same is true of Continental Motors, which, although no definite closing date had been fixed, had anticipated a slowing up around July 1 with a possible temporary shut down. Vice-President G. W. Yeoman said the plant would continue to operate on the present basis and all indications point to a steady demand. Yeoman reiterated his statement that the company would operate just as long as compelled to by incoming orders and from time to time might shut down for two or three day periods, though no general closing down was anticipated.

Hupp Favors Short Closings

The same attitude is apparent at the Hupp Motor Car Corp. plant. Hupp has been building 80 cars a day, basing production strictly upon sales demand and it is the intention of Hupp executives to close down for short periods from time to time as the market fluctuates. President Hastings said demand is brisk and there is no indication to-day that the plant will have to slow up.

Employment figures for the last week in 79 factories in Detroit show 559 less men at work than during the week previous. The total employed was 109,621 in the 79 factories which includes practically all the automobile plants. Short time schedules were in force in 25 concerns which were working 6391 men on an average of 21¼ hours weekly. The figures are for the week of June 21.

Upstate concerns appear to be in good shape as far as production is concerned, due to the stimulation in sales as a result of the price cuts. This is true particularly of the Wilson Foundry & Machine Co. at Pontiac. Orders bringing production close to the maximum of last year are reported by D. R. Wilson, general manager.

"We passed the 1000 mark on the payroll last week," said Wilson, "and we are so busy trying to keep up to the demands of the Overland plant that we expect to be compelled to work a Sunday shift. Rush of business at the Willys-Overland plant is keeping up, and reserve orders have grown to such an extent the plant is assured of its schedule through August.

"We have orders to turn out 550 jobs a day and that number is going through the shop. The Overland plant, however, will use that number, so we have little chance of getting ahead of it. This will necessitate our working on Sunday. We have been summoning former employees wherever it was possible to locate them, and the total number on the payroll has been substantially increased within the last two weeks."

FISK ADDS NIGHT SHIFT

CHICOPEE FALLS, MASS., June 27—The Fisk Rubber Co. has added a night shift of 300 men to its force and has increased the day force by 250. Increased demand for certain sizes of tires is the reason for the expansion of production.

Milwaukee Plants to Resume July 1

Accumulation of Finished Stocks in Factories Now Sold—Expect Steady Demand

MILWAUKEE, June 27—Between July 1 and 5 there will be a general revival in the operation of passenger car factories in this and other centers of production, while at the same time some shops which have been virtually closed down for a number of weeks will resume work. The recent accumulation of finished stocks has been worked down to the point where new production is necessary and new orders from distributors and dealers are being received in a relatively generous measure.

The trade has received material assistance in moving goods by the recent price reductions and this good influence is being passed on to the factories. Makers of parts and accessories and general equipment are proceeding at a fair rate of output and expect to be in position to make steady progress. In general, the opinion is expressed that with the resumption after July 1, factories will be able to run steadily until the end of the year at least.

Business and Financial Comment, a monthly review of local industrial and commercial conditions, issued by the First Wisconsin National, the largest bank in Milwaukee, says the following concerning the automotive industries:

"With one or two exceptions, business in automotive parts and accessories fell off in May compared with April. Gratifying as the gain in this line has been during the spring months, the business done falls 40 or 50 per cent short of the same months last year. The recent and rather abrupt decline in motor car sales is to a considerable extent seasonal.

"The experience of the spring season, however, has shown the industry that cars were priced too high for the buying power of the country. The letting down in prices of most of the leading companies may bring out a better demand in the fall selling season, especially if general business revives.

"The tendency of prices in automotive lines, to a large extent, hinges upon stabilization in the steel industry. Demand for motor trucks parallels new construction work. Demand from that source this year so far has been limited, as the carry over of trucks from last year is nearly sufficient to take care of needs until new construction of all kinds expands."

DODGE LINES UP WITH N. A. D. A.

ST. LOUIS, June 28—Following the action of Charles W. Matheson, sales manager of Dodge Bros., in recommending that all Dodge dealers become affiliated with the National Automobile Dealers' Association, General Manager Harry Moock announces that there are now 297 Dodge dealers enrolled.

Durant Sold Ahead on Eastern Output

Orders for 20,000 Schedule at Long Island Plant Placed—Car Details Given

NEW YORK, June 28—Production of the new Durant car will be started at the Long Island City plant about Aug. 1. It is understood that approximately 20,000 orders for the car already have been received from the Eastern territory. This will keep the plant running at full capacity for a year. Experimental work on the four-cylinder car, which will sell for $890, has been completed and it is practically ready for inspection.

One of the main advantages of the car, its makers contend, is the low maintenance cost which will result from the remarkable accessibility of its various parts. Another point in its favor is said to be the unusual number of refinements in body design. More than the usual amount of leg room is provided in the front seats and the same is true in the rear. The car, which will weigh 2300 lb., fully equipped, will be rated at 24 hp. and will develop a speed of 50 m.p.h. on a level road. Tests have demonstrated that it will average 17 miles per gallon of gasoline.

One of the principal features of the chassis construction is the use of two tubular struts between the cross frame members. These are used not only to stiffen the frame and take out a good deal of the weave, but are also used in place of the exhaust pipe and muffler. These simply act as an expansion chamber and there are no baffle plates used in the construction.

Special Continental Engine

The engine is a four-cylinder block type, made by Continental especially for the Durant car. The valves are of the overhead type, are inclosed, and the exterior of the engine is very smooth and clean. Ignition is by a battery system and the coil is mounted on top of the timing gear case. Servicing has been very carefully considered and all the members, including engine, clutch and gearbox, can be removed without disturbing any of the other members. The oil pump is of the rotary type, very small, and is on the outside of the crankcase at the right, with the water pump on the left side. Aside from these, and the coil, there is practically nothing on the outside of the engine.

The clutch is of the plate type, with a single steel disk, which is slotted, to allow for expansion under heat and prevent warping of the plate. The plate has a molded asbestos floating ring on each side, and the entire assembly is taken out by taking the cap screws out of the cover plate, which carries also the expanding fingers.

The instruments are mounted on a sheet steel instrument board, painted, varnished and grained to represent Circassian walnut to correspond with the rest of the woodwork. The steering wheel is solid walnut and the spider is partly aluminum and partly walnut, giving a very handsome appearance. Upholstery is in real leather.

The axles are fitted with Timken bearings, and the rear is of the three-quarter floating type. The carburetor is a Tillotson. Springs are semi-elliptic and the extra tire carrier on the rear is so mounted as to make a very stiff job. The tires are 31 x 4 and are on artillery wood wheels.

The body appointments are very well looked after and there are pockets in each door, each one accommodating the curtain which goes directly above it. The rear deck is double, with the straps concealed between the plate glass rear window.

TWO NATIONAL SHOWS ARE SET FOR JANUARY

NEW YORK, June 27—Dates for the 1922 New York automobile show have been tentatively fixed for Jan. 7 to 13. The show will be held in Madison Square Garden. The Chicago show will open in the Coliseum Jan. 28.

Warner to Reincorporate as Delaware Corporation

TOLEDO, June 27—Preliminary notice of the dissolution of the T. W. Warner Co. of Muncie, Ind., has been filed at Indianapolis preparatory to turning over the assets of the Indiana company to a new corporation of the same name which will be incorporated under the laws of Delaware. Explaining the plan to-day, T. W. Warner said:

"Our business has been enlarged to such an extent that new corporate powers were needed. We will be affiliated with Durant Motors, Inc., but will not become a corporate part of it for some time at least. Manufacture of parts for the new Durant car is going forward and production is increasing from week to week."

DURANT IN NEW QUARTERS

NEW YORK, June 28—W. C. Durant and the headquarters organization of Durant Motors, Inc., is now settled in its permanent location on the eleventh floor of the new Gotham National Bank Building at Broadway and Fifty-ninth Street. Admirers of Durant signalized the move by sending him quantities of flowers, which greeted him when he reached his office Monday morning.

GERMAIN DENIES REPORT

DETROIT, June 28—Leon R. Germain, vice-president of the Old Motor Works, denies that he will resign to join Edward Ver Linden, former president of Olds, in the development of the Durant Motors of Michigan, in Lansing.

Overland to Make 12,000 Cars in July

Sales for Month to June 15 Reported 18,000—Other Toledo Plants Busy

TOLEDO, June 27—The automotive business increase which has forced the enlargement of working forces at the Electric Auto-Lite Corp., the Champion Spark Plug Co., and has necessitated the working of a night force at the plant of the Mountain Varnish Co., was emphasized when Willys-Overland officials gave out the word that the July production schedule was for 12,000 cars as a minimum.

If production can be speeded up as the month rolls along it will top this number by several hundred. And then orders will not be met. In June the Overland has gone far in building up its organization. Production of cars for the month was fully 100 per cent above the number turned out for May.

Sales Manager A. C. Barber announced this week that the Overland sales from May 16 to June 15 had amounted to 18,000 cars. Actual delivery in the first two weeks of June exceeded 6500 cars, according to his report.

For the first time in months the Willys-Overland Co. is advertising for all kinds of mechanics. They are being absorbed into the forces at the plant here at the rate of about 200 a day. A drive-away of 150 cars on Friday illustrated the way things are going. Of these cars 35 went to Columbus and 25 to Cincinnati and the rest to intermediate and smaller towns.

The Mountain Varnish Co. is practically a subsidiary of the Overland. The calls for paint and varnish for the automotive trade has forced the plant to get into top speed production this week.

The Auto-Lite factory here has been crowded with work for more than a month and it is noticing a gradual increase every week.

Overland Price Change Creates Business Rush

PHILADELPHIA, June 25 — Passenger cars are being shipped by factory to Philadelphia in large numbers, which promises well for the industry.

For instance, the Overland-Harper Co., according to H. B. Harper, president, is enjoying an increase of more than 40 per cent over the business done for this period in 1920 and a 70 per cent increase over that done in the corresponding period of 1919. Since the price reduction, Harper says, orders are coming in so fast that they cannot be filled. A solid trainload of Overlands and Willys-Knights has arrived.

"The first eight days' business in June is the greatest for the period that I have ever had," said Harper.

Ninety per cent of the cars on the way, added Harper, are promised.

June Sure to Lead Year's Sales to Date

New York District Far Behind on Deliveries—Summer Outlook Improved

NEW YORK, June 27 — This month unquestionably will be the biggest month of the year to date in passenger car sales in the metropolitan area. Cars on which recent substantial reductions were made are selling heavily and others whose reductions were announced in May, have not yet lost entirely the impetus given by lower prices. Business as the month closes indicates that the July and August let-down in sales will not be any more serious proportionately than it has been in past years. Practically all dealers expect sales to drop off materially during those two months, but that is a perfectly natural condition in any community which is intensified in New York by the fact that a large percentage of the people who own or are able to own automobiles spend the heated months out of town.

Buick, Studebaker and Dodge, whose salesrooms have been flooded with orders since their recent reductions were announced, are still considerably behind on deliveries and some of their disappointed customers are turning to other makes of cars, which is helping business generally. Maxwell ran behind on deliveries in May but has been able to catch up this month.

In Brooklyn, where some of the motor car establishments rival those of New York proper in importance, sales have been heavy throughout the month. Dealers there are also having a fairly lively service and accessory business.

The Bronx and Westchester Counties and Newark, N. J., also report big sales.

Richmond County, which comprises Staten Island, lying in New York harbor, has had a fine May and June business in practically all lines. Buick, Overland and Ford dealers are oversold and are forced to ask customers to wait.

Motor truck business in the metropolitan area, which was not as good in May as it was in April, is picking up again.

The used car business has been seriously affected by repeated reductions in new car prices and the public is showing a hold-off attitude. A fair number of sales are being made but in many cases these are at a sacrifice, owing to sudden new car reductions depreciating values of used cars in dealers' hands.

FAR WEST OUTLOOK BETTER

RACINE, WIS., June 27—John Tainsh, general sales manager of the Mitchell Motors Co., Racine, Wis., has returned from a tour of investigation of business conditions and prospects along the Pacific Coast. Concerning his findings he said: "Things look decidedly better in the Far West and Pacific slope and I feel sure that within a few weeks the whole automotive industry will be in much better shape. My swing out to the Pacific has shown me that already buying has become much better and that the interest in motor cars, the growing tendency to regard the automobile as an essential part of our economic structure is just as great."

Bank President Urges Quick Price Action

(*Continued from page* 1446)

to show that the industry has now been stabilized after these midseason price changes, that no more changes are probable, and moreover, that if there should be any further price changes it would more than be offset by the reduced value of the car which the average buyer now has to trade.

"From our survey of the field it would appear that the new prices represent extraordinary values in motor cars, because they are so little above the prewar prices, to say nothing of the fact that many of these new models are better equipped, better made and better finished than the products of five years ago.

"While I appreciate the difficulty of concerted action by nearly two hundred manufacturers of motor cars and motor trucks in an industry as big as yours, the National Automobile Chamber of Commerce has been such a constructive force for so many years and the automobile industry is in so much better shape than the majority of trades in this country, that I hope your organization will undertake to convey to its members some of those things which I am prompted to suggest because of our high interest in the motor car sales in the eastern territory.

"Can you, or through you, can the manufacturers, give us any assurance of a continuation of operations by the manufacturers on the present basis of prices and values? Some certainty along these lines will materially help the dealer in his plans for maintaining his organization and sales work that would permit broader plans for financing his requirements on the part of banks and ultimately be for the best interest of the public, the manufacturer and the retailer.

"Please be assured of the readiness of our bank to render every possible assistance in the solution of this problem for further stabilization of the automobile industry."

FORT WAYNE BUSINESS GOOD

FORT WAYNE, IND., June 27—While the automobile business in this city is not as good as it was a year ago, the leading dealers seem to be pretty well satisfied with the business they are doing under present conditions.

S. F. Bowser & Co., pump manufacturers, have put on a night shift of seventy men and the Wayne Oil Tank & Pump Co. has been working overtime for some time. The Dudlo company, manufacturer of magnet wire, is also showing a good increase.

Fall Outlook Cheers Cleveland Dealers

Feeling Unanimous for Profitable Business—Buying Starts in Rural Communities

CLEVELAND, June 28—Cleveland retail automobile dealers are a unit in saying that the business so far in June is better than it was in May. A great many of the dealers visited said that the record for June this year is better than it was a year ago. Others made the statement that deliveries of cars for the first six months of this year are greater than a year ago in the same period, and their net profits are running higher this month than in June, 1921.

The big point about the Cleveland retail dealer is that he is cocky about his prospects for the next six months. Every man along Euclid Avenue is dead certain that he is going to enjoy better business the next six months than he did a year ago; in fact he expects to go way ahead of the figures for the last half in 1920.

Wholesale dealers have been cheered by an increased demand by Ohio farmers for cars. They are buying better than they did earlier in the year. The crops are soon to be harvested and that is said to have an influence on the market. Dealers in small towns throughout the Buckeye State are coming here more frequently for cars this month than they did in May or in June a year ago. Long strings of new cars that are being driven away may be seen daily on the streets.

WESTERN SUPPLY ADDS STORES

SEATTLE, June 27 — The Western Auto Supply Co., operating a large chain of automobile tire and accessory stores in the western half of the United States and capitalized at $3,000,000, has just completed negotiations for the purchase of the eight large stores owned and operated by the Autoparts Supply Co., a half-million-dollar corporation, operating in Seattle, Portland, Tacoma, Spokane, Yakima, Bellingham, Walla Walla and Boise.

For the present the stores of the Autoparts Supply Co. will be operated as a subsidiary company, and there will be no radical change in management or personnel.

PREMIER SEES CLOSED DEMAND

INDIANAPOLIS, June 27—H. E. Doty, sales manager of the Premier Motor Corp., believes closed body jobs will increase during the present year and will be in greater demand next year than ever in the history of the industry. Because of this belief, production schedules at the plant have been changed so that now about 40 per cent of the cars produced are closed cars. According to Doty, orders during the past month or six weeks indicate a decided change to this type of body

Plenty of Business Reported in Kansas

Principally Matter of Salesmanship—Price Cuts Encourage Dealers—Harvest Near

TOPEKA, KAN., June 25—Business in Kansas in largely a matter of what the dealers make it. Live dealers everywhere are selling cars, and this does not mean necessarily dealers in cars whose prices have been slashed in the present reductions. There appears to be business where it is properly gone after, even in the oil producing section of the State, which is now in considerable of a slump due to low crude prices.

General business in the northern part of Kansas is in better condition than in the southern oil territory. Whatever sales resistance there is in this section is being dispelled by the live dealers. There are some complaining of lack of business and a few who speak of cutting into some other line after July 1, but most dealers are keeping busy.

Wheat is in good shape in practically all sections of the State, but there will be no definite reactions based on the crop until after the harvest which starts now at any time. Business in Kansas is bound to be better after the harvest. It always was before and it will be now.

Price reductions seem to have had a greatly beneficial effect in all towns. Dealers are going after business greatly fortified by the price argument and are closing sales which were impossible under the old prices. Many buyers were known to be merely waiting for the reductions and their closing was a mere matter of form. One dealer whose weekly sale average was two sold fourteen in the first week after his car was cut.

The morale of dealers as a whole is good. There has been some discouragement from various causes during the past few months, but they have been holding on well and are now regaining their former pep.

REPORT MORE SALES FOR CASH

QUINCY, ILL., June 25—Automobile trade is fast returning to conditions of two years ago, according to R. H. Patterson, local Overland dealer, who adds that there has been "more business in the last two weeks than in the last two years."

Recognition that the automobile trade has hit rock bottom in prices, he believes, has encouraged buying and purchasers come into the market with more free money, less chattle mortgages and promissory notes than in late months.

PRICES HURRY PURCHASERS

FORT WAYNE, IND., June 25—The recent price reductions in some of the leading makes of cars brought a veritable rush of orders and to the local dealers handling these cars. The Shryock Automobile Co. sold nine Buicks on the first day after the price reduction went into effect to purchasers who came to the company's salesroom without solicitation. The Hayner Co., dealers in Ford, reports that the Ford reduction quickened business immensely. It is expected that the present boom in the selling of cars in this city will continue for some weeks at least. Dealers believe that a great many local people who have really been wanting cars have been holding off buying on the hunch that the price reductions were sure to come.

Grain Harvest Brightens Trade Outlook in Texas

DALLAS, TEXAS, June 27—The automotive industry in Dallas and this district continued to show an improvement generally during the first half of June. There was not a line of the business but reported improved conditions and brighter outlook. The prediction is being made freely in Dallas that the industry in Texas will be back to normal before the snow flies.

Dealers reported more cars sold during the first fifteen days of June than any other month of the year. This was even true of the used car dealers. An important point is the dealers are selling for cash. Truck dealers reported increased sales and deliveries.

Tire men declare business looks like old times.

There has also been an increase in the business of the implement and tractor dealers. This probably was due to harvest time or necessities for new farm machinery. In these lines prospects are much brighter. In some instances it was said grain farmers are now paying accounts more than a year old. The implement and tractor dealers believe with a $40,000,000 grain crop being harvested in Texas their business as well as that of the motor industry generally will be much better during the remainder of the year.

Approximately $100,000,000 worth of roads are under construction or will be before the year is gone.

NASH REOPENS "FOUR" DIVISION

MILWAUKEE, June 27—The four cylinder car division of the Nash Motors Co. at Milwaukee, which was virtually shut down June 1 pending readjustment of materials and stocks, will reopen July 5 at the same capacity. About 850 men are being called back to work. The Milwaukee plant is under the general management of B. W. Twyman.

DETROIT BODY PLANT SOLD

DETROIT, June 28—Hugh O'Connor, president of the Michigan Wire Cloth Co., was high bidder for the property of the Detroit Weatherproof Body Co. sold by the Security Trust Co. as receiver under an order of the Federal court. O'Connor bid $140,000 for the property as a going concern and his offer will be submitted to Judge Tuttle for acceptance or rejection.

California to Keep Sales at High Point

Dealers Turn Down Proposals for Week End Closing—Registrations Heavy

LOS ANGELES, June 25—During the four months beginning Feb. 1, California has been buying automobiles at a heavy increase over the corresponding period of 1920. Feb. 1 is picked because that date starts the registration year in this State. Fees exceeding $6,000,000 have been collected by the motor vehicle department in that period. These have been paid by 540,000 automobiles, 30,757 trucks, 2,456 trailers and 14,427 motorcycles. The increase in fees over the first four months of 1920 has been $1,150,000. Motorcycles show a reduction in numbers and a corresponding loss in fees.

In Southern California during May, 4888 new passenger cars and 632 new trucks were registered, a total of 5520. The gain in passenger cars over April was 727. The total registration from Jan. 1 to June 1 in this part of the State was 21,125, which includes a gain of 2274 passenger cars over May, 1920. A very interesting fact revealed by the registrations is that more higher price trucks have sold than passenger cars of an equal number of makes and corresponding prices. The leading passenger car gains made in May over April were: Buick 50, Ford 246, Chevrolet 133, Hupmobile 51, Oakland 69.

Comparatively few price cuts had been put into effect during May and the brisk business is to be attributed more to hard work on the part of dealers than anything else. The buying public has not been allowed to become pessimistic and lose sight of the need for motor vehicles. With price cuts to help out, it is predicted that June will be a record breaking month.

That the dealers propose to keep on working at top speed was demonstrated at the meeting of the association to-day, when it was voted against Saturday afternoon closing. Some salesrooms are remaining open at night and a few have gone so far as to advertise they are open Sundays, too. The latter has not become a general practice but there is no foretelling what the precedent may bring about.

TEXAS TAKES BUICK TRAINLOAD

DETROIT, June 25—Col. B. B. Webb, Buick branch manager at San Antonio, Texas, left an order this week at the factory in Flint for a train load of Buicks. Col. Webb declares automobile sales in Texas are picking up rapidly and the section is fast recovering from the slump which appeared to be more acute there than any other place in the country. George S. Schroeder, general manager of the Vesper-Buick Co. at St. Louis, also was at the plant this week arranging for a 400 car shipment to the dealers in his territory.

Big Nitrate Plant May Go to Ford

Visit to Muscle Shoals Admitted at Offices as View to Purchase —Power Facilities Large

DETROIT, June 28—Henry Ford has inspected the immense Government nitrate plant at Muscle Shoals with a view to buying the property. This was admitted at his offices to-day, but all further information was refused. There has been no intimation as to what disposition would be made of the plant if he acquired it. Completion of the great Wilson dam and carrying to a conclusion of the original plans of the Government for the production of nitrate, would provide enormous quantities of nitrate for fertilizer and would be a great boon to the farmers of the United States.

Favorable Steel Supply

BIRMINGHAM, ALA., June 28—Henry Ford recently went to Muscle Shoals incognito and examined the Government property. He was discovered just about the time he was ready to leave, but refused to give out any information, simply saying that he was inspecting the Government property.

Aside from the advantages to be gained in operating an automobile manufacturing plant at Muscle Shoals, the two nitrate plants, now completed, furnish a splendid opportunity for money making and service. The plants, with slight alterations, will manufacture fertilizer, leaving them intact for the manufacture of nitrate for gunpowder in case of another war.

The power house, which is already complete, is the second largest in the world, engineers estimating that the Government spent millions in making it modern in every way.

Many advantages would be realized by the purchaser of Muscle Shoals, especially if he happened to be an automobile manufacturer. Freight rates, both by water and rail, are lower than at other inland points. Sheffield and Florence have three furnaces from which materials for steel can be had, eliminating the necessity of hauling iron from some distant point.

The Tennessee River is a larger stream than some of the principal waterways of the country, and but for the obstacle of Muscle Shoals would be navigable from Knoxville, Tenn., to the Mississippi River.

Muscle Shoals offers an ideal site for a hydro-electric plant. It is 18 miles in length and has a fall of approximately 100 feet. By damming the river at the end of the shoals immense power would be developed, and at the same time the dam would open the river to navigation for its entire length. Wilson dam, as planned, is a gravity section structure about four miles east of Sheffield and two and one-half miles from Florence. The dam crest is 80 feet above the elevation of the river bed, carrying gates 18 feet high and raising the water level to a height of 98 feet above the stream bed. This creates an available maximum of 500,000 hp. Four units of 30,000 hp. each have been contracted for, and space for 14 additional units have been provided for in the power house design, each carrying 30,000 hp.

Experiments on products which heretofore came from Germany could, if the property was purchased by a manufacturer, be continued as nitrate plant number 1, which was built for experimental purposes and which has been used for testing and making dyes and other experimental work.

Central Products Group to Double Work Force

DETROIT, June 27—Central Products Division of General Motors Corp. contemplates doubling its working force in Detroit within the next 30 days. From 2000 to 2500 men are employed at present by that unit and this number will be increased to at least 4000 in the next month. Within five months the new plant of the Central Products Co. will be completed and the working force increased to about 6000.

The information was disclosed in a request of the corporation made to the City Council Saturday in a petition asking for the widening of Holbrook Avenue from St. Aubin Avenue to the Grand Trunk Railroad. The petition asked that the street be widened to 86 feet and paved with asphalt, the corporation offering to give a strip 10 feet wide on each side, but asked that it be relieved from any special assessment and that the city replace the present sidewalk.

The Central Products Division includes the three factories located along the section which the corporation seeks to have widened, and are the Central Axle Co., the Central Gear Co., and the Central Storage Co. The new factory in process of construction is the Central Motor Co., also a part of General Motors.

The petition to the council was signed by L. B. Robertson, general attorney for General Motors Corp. The petition states further that at the end of 10 months it will be necessary to put on night shifts, increasing the corporation's working force in the Central Products Division to 9000.

R. & V. OPENS FACTORY BRANCH

EAST MOLINE, ILL., June 27—R. & V. Motor Co. has opened a factory sales and service branch at Cincinnati, operated by a corporation separate and distinct from the manufacturing company, but controlled by the same interests. It will be known as the R. & V. Motors of Cincinnati, Inc. Paul Andree, who has been associated with the company for twenty years, has been appointed manager, and will be in charge of the retail and service division. Formal opening will be Aug. 1.

Denby Creditors Act on Company's Future

Meeting to Decide on Receivership or Continued Operation Held in Detroit

DETROIT, June 29—The future of the Denby Truck Co. will be decided at a meeting to-morrow afternoon of the 55 creditors whose claims remain unsatisfied. While no definite plan has been outlined, it is the belief of the creditors committee that continued operation, even under the present market conditions, would be better than liquidation, which it is declared would be suicidal.

Application for a receiver, in the opinion of E. R. Ailes, treasurer of the Detroit Steel Products Co. and a member of the committee, could mean only liquidation, for it is considered highly improbable that a court would authorize continuance of business under market conditions now prevailing.

"We have not had a meeting for six months," Ailes said, "and we want the creditors to get together to talk over the situation and decide upon the best move to make. We want them to say whether the plant shall continue in the hope of better times or liquidate the property.

"All but 55 of the creditors have been paid off by Major Edwin Denby and J. Walter Drake, but of course their claim stands against the company. The total indebtedness, including banks, approximates $650,000. There are no bonds outstanding, however, and the plant is free and clear. The only need now is working capital, but no one can be found at this time in a position to advance the money needed.

"We have abandoned the idea of refinancing at present. We could, of course, raise money by means of a stock issue, but that is out of the question, particularly at this time with Major Denby in the Cabinet. My idea is that it is better to keep going and turning over as much as possible, losing a little each month, but that is up to the creditors to decide. The company is no worse off than others which are operating at a continued loss.

"Creditors who attended the last meeting were highly satisfied. Naturally there are disgruntled creditors, one of whom started suit, but we satisfied him, and I am inclined to believe it will be decided to continue operations. The company has a splendid plant, a good product and an opportunity to make money when business conditions improve.

TIMKEN BEARING ADDS MEN

COLUMBUS, June 27—C. N. Repogle, general manager of the Columbus branch of the Timken Roller Bearing Co., has increased the force at the plant from 250 to 450 men. He is of the opinion that still further additions to the working force will be necessary.

Offers Resolution to Bar Trucks

Graham Asks Tax to End Reimports

Proposes 300 Per Cent Duty on All Supplies Sold Abroad by Government

WASHINGTON, June 29 — Congressman Graham of Illinois, formerly chairman of the select committee of the House to investigate expenditures in the War Department, has introduced a joint resolution which would specifically prohibit the reimportation of surplus war supplies except at a duty of 300 per cent, which in effect would be an embargo.

In a statement to AUTOMOTIVE INDUSTRIES to-day, Graham stated that the resolution covered all supplies sold abroad by the Government and was drafted in order to expedite legislative action. He expects its passage in the Senate and House before the tariff bill has completed the circuit.

The permanent tariff bill, as reported out by the Ways and Means Committee to-day, contained no specific reference to reimportation of trucks as had been anticipated in some quarters. It is possible that this situation may be remedied on the floor of the House during the tariff debate when the bill is subject to amendments.

Congressman Graham stated that he was convinced his resolution would prove more effective. Assurances have been given, he said, that the Ways and Means Committee would approve it as a special measure looking toward the protection of domestic markets.

The joint resolution fixes a duty of 300 per cent ad valorem on all goods, wares, merchandise, military and naval supplies of any kind whatsoever originally exported from the United States for use of the American Expeditionary Forces or their Allies, when reimported into this country. Graham is acquainted with the practices of European and American speculators in buying this equipment at extremely low prices, generally below cost, and reselling in this country after slight alterations or remanufacture. The flat rate will apply at American valuations.

Provides Retaliatory Motor Vehicle Duty

WASHINGTON, June 29 — Retaliatory duties against countries which erect tariff barriers to stop importations of American automobiles has been provided in the permanent tariff as reported by the House to-day by the Committee on Ways and Means after six months' study.

The bill proposes a 25 per cent ad valorem duty on imports of automobiles, automobile bodies, automobile chassis and parts of automobiles including tires. Special provision has been made for the establishment of reciprocal relations under the direction of the President, a plan approved by the National Automobile Chamber of Commerce.

The rates on automobiles are 59 per cent lower than the N. A. C. C. had recommended but sufficiently high to prevent effective competition from foreign manufacturers. The duties had been 45 per cent on higher priced cars and 30 per cent on medium priced machines.

The retaliatory measure is not confined to automobiles, but it is aimed at the French and Italians who put up tariff barriers last summer with specific rates for motor cars. It is provided in that if there be imported into the United States any of the articles manufactured in or exported from any country which imposes a duty greater than 30 per cent ad valorem upon similar articles exported from the United States, there shall be levied on such articles a duty equal to the duty imposed by such country upon such articles imported from the United States, but not to exceed in any case 50 per cent ad valorem.

A rate of 30 per cent is applied to imports of aircraft as a retaliatory duty.

Dowell Road Bill Is Passed by House

WASHINGTON, June 29—Highway legislation has struck a snag here owing to the passage of the Phipps-Dowell bill in the House this week, providing for continuation of the Federal aid system with a system of interstate roads and a commission to direct the work.

The Senate has this bill and the Townsend bill pending. It is a question of parliamentary tactics which shall have the right of way in the Senate. It is believed that Senator Townsend will effectively block the Dowell bill in the Senate unless the essential principles of his measure, endorsed by the National Automobile Chamber of Commerce and other automotive organizations are accepted in amendments.

Truck Auction Bids Appear Fictitious

NEW YORK CITY, June 29—Auction of 200 reconditioned army trucks reimported into this country by the Truck Co. of America was started here to-day and will continue until July 1. Judging from to-day's sales there was very little participation in the bidding by the public and the sales prices were seemingly fictitious. Macks of 5½-ton capacity sold

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Congress Clears Way to Action on Trucks

May Include Protective Principle in Anti-Dumping Provisions of Tariff

WASHINGTON, June 27—Indications are that the House Committee on Ways and Means will dispose of the reimportation evil, which has affected automobile dealers more than anyone, by a special clause in the permanent tariff bill as a principle of protection rather than a specific class legislative measure. Incorporated in the anti-dumping provision, it would become one practicable and available method of checking the re-sale of American trucks in this country by foreign sales agencies which purchased them as surplus army equipment. The Class Journal correspondent was advised by high official sources that diplomatic efforts to adjust the situation had failed and it became solely a legislative matter.

It was learned that this government had made representations to the Government of France but was subsequently advised that the French authorities were powerless to prevent reshipment of American trucks and other goods. The correspondent was informed that the admission into or exclusion from the United States of these products is not covered by contract or treaty stipulations under the administration of the State Department. It is not accurate to imply that the State Department objects or has objected to efforts looking toward restriction of sales of trucks or other army supplies.

Dealer Action Unopposed

In other words, the State Department has entered no objection to the campaign of American automobile dealers and manufacturers to prevent reimportations, as had been currently rumored in the trade. The fact that they had discussed the matter diplomatically with the representative of the French Government shows that they were endeavoring to present the American business man's side of the problem to foreign governments, whose nationals had purchased Army supplies for speculative purposes.

It is understood that members of the Ways and Means Committee are in sympathy with the plan to protect the American market. As nothing has been adduced to show that the Commission which disposed of the surplus material made it obligatory upon the purchasers to sell in countries other than the United States, it is a matter which Congress alone has the power to control by specially designed legislation.

Tire Dealers Draw Protective Measures

Will Seek Handling of Bargain Stocks—Convention and Show in Cleveland

CLEVELAND, June 28—The first convention of the National Tire Dealers Association will be held in this city on Oct. 18, 19 and 20 at the Hotel Winton, which will be headquarters for the delegates.

A tire and tire accessories exhibition—the first of the kind to be held—will be conducted while the convention is in session.

These two decisions were reached at a meeting of the board of directors of the National Tire Dealers Association, which was held in this city June 21 and 22.

Resolutions placing the association on record against producers of tires or their representatives holding financial interest in retail stores and pledging the officers of the association to obtain data on offerings of standard tires at attractive prices and then forward same to members of the trade body, were adopted by unanimous vote.

Members of the board present included Thomas F. Whitehead, Chicago, president of the association; R. F. Valentine, Cleveland, vice-president; H. O. Stenzel, Milwaukee, treasurer, and Philip O. Deitsch, Cleveland, secretary.

The offer of the Cleveland branch of the national organization to finance the expense of the convention and to arrange an attractive program was responsible for the decision to meet here. The proximity of Akron, the center of the rubber tire industry, also was a controlling factor. There will be from 700 to 900 delegates in attendance, and Secretary Deitsch announced that a general invitation to all wholesale and retail tire dealers, regardless of whether they are affiliated with the organization, to attend the convention would be issued.

To Visit Akron Factories

Akron manufacturers will provide motor transportation for a trip by the delegates to the rubber city, and part of a day will be spent in the larger tire producing factories in that city so that all delegates may return home with some new talking points for their products and a better understanding of production methods.

To Valentine was delegated the responsibility of arranging the program for the convention and also for the tire and tire accessories show. He will announce committees shortly. Efforts will be made to obtain exhibits from every tire and tire accessory producer in America. While the features of the show have not been decided upon, already there is talk of inducing some producers to stage various phases of production. Educational features, such as lectures and demonstrations, to help the wholesale and retail tire dealer in his work are to have places on the program of the convention.

Under a resolution adopted, the secretary was directed to compile each month inventories of stocks in business establishments of dealers and distributers. The record so made up is to be given members of the association and manufacturers as a means of informing both on conditions in the trade.

Officers of the association have received many complaints from dealers relative to a certain producer of tires being financially interested in service stations scattered throughout the larger cities and along highways that are traveled to a large extent. It is charged that this concern gives free maintenance service to the detriment of the bona fide retail dealer who maintains a service department. Autoists who have been held up by flat tires in the country and have had a service truck come out from this concern's nearest branch and make free repairs or adjustments have complained when dealers charge for similar service.

Executives of the association also were instructed to watch keenly for opportunities to purchase standard tires at low prices. It frequently happens, according to information received at headquarters here, that producers of automobiles when forced to cut production of cars are caught with large stocks of tires. When their bankers ask them to liquidate their inventories, they proceed to dump tires on the market at reduced prices. The dealers want the first opportunity to purchase these tires.

Copies of the resolutions adopted will be mailed to car makers, tire producers and the national trade organizations of each.

Receiver Is Named for Republic Rubber

YOUNGSTOWN, June 27—G. H. Booth, vice-president, has been appointed receiver for the Republic Rubber Corp. by Judge D. C. Westenhaver of Cleveland. Suit was filed against the Republic Rubber Co. by Elizabeth Hines Gates of New York, a preferred stockholder, and against the Republic Rubber Corp., by Arthur L. Irish, a former Republic official, who claims to hold 90 per cent of the common stock.

The company claims to have purchased large quantities of cotton and rubber at high prices and that price declines were such that they could not manufacture and sell profitably. They have outstanding commitments on these goods amounting to $2,000,000. A. L. Irish alleges that the company owes $500,000 in past due notes. Bank loans are reported to aggregate about $2,000,000. Other loans will amount to several hundred thousand dollars.

Reports are to the effect that much of the company's losses are represented by new contracts made after much of the original loss had been largely cleared away by former president, E. F. Jones.

The manufacturing plants will be operated for a time at least, it was stated to-day. The receiver is working on a policy to be pursued in handling the property.

Akron Well on Way to Normal Business

Factory Schedules Placed Higher for July—Would Avoid 1920 Peak Conditions

AKRON, June 28—Present conditions in the industry do not assume the aspect of a boom and the tire industry is far from normal. But the marked improvement of the past four weeks both in car manufacturers' original equipment specifications and in the steadily increasing volume of dealers' sales affirms the opinion that the curve of tire production definitely and permanently is upward.

June 20 Goodyear called for 1200 tire builders. Two days later Goodyear called for 1500 more tire builders, and took on even additional men, absorbing approximately 3000 men during the week. Just what Goodyear's production will mount to has not been determined. Before re-employing the 3000 men, however, the company had climbed to a production ticket of 20,500 tires a day. That the Goodyear increase will approximate 50 per cent of present production is almost certain. This will carry the company back to a position far above normal and closely approaching peak production of a year ago last May.

Officials of the company claim that dealers' sales compare favorably with any normal week in the company's history and are larger than the corresponding weeks of last year. In addition car manufacturers have unexpectedly doubled and some have trebled tire specifications for July.

The Firestone factories, in order to handle increased dealers' orders and car makers' orders, have gone to two full 9-hour shifts daily and a 5½-day week. This will carry Firestone back to at least 20,000 tires a day. Goodrich continues at about 15,000 tires daily and has announced no contemplated production increase.

General Business Better

Business conditions in Akron already show the reflection of the improvement in the tire industry. The reinstatement of the 24-hour daily schedule has necessitated augmented street car service to East Akron. Business houses report that retail business shows the stimulation already. Financial conditions are tight and apparently immobile, but the general impression exists that Akron is well on the way to normal conditions.

The city, however, does not want a return to peak conditions. Akron does not want a floating population. It does not want thousands of transient laborers—the "suit case chaps," as they were called—increasing labor turnover, causing congestion in residential districts and swelling the city's crime record and night life. All manufacturers re-employing men are showing preference to Akron men now out of work.

Tire Demand Heavy in Chicago District

Price Reductions Influence Resumption in Buying—Farmer Sales Reported Better

CHICAGO, June 27—Direct reports from the large tire distributors in the Chicago territory, which in most cases covers three or four States (Indiana, Illinois, Wisconsin and Iowa), range through all the degrees of business activity from "good," which represents zero, to "three times the volume of business we were doing a year ago," which is the summer heat point without any shade. It is confusing to try to account for these widely ranging reports of business conditions and it is just as satisfying, perhaps, not to try to account for the statements and say that the tire business in this territory is unusually good and far beyond anything that the distributors thought they had a right to expect. The pick-up came very suddenly and at once grew into steady sales.

Price reductions in all the standard makes of tires have had the heaviest influence in stimulating sales. Cars that were running without "spares" are fast adding extra tires; old tires that were given long mileage during the long open winter are now being replaced.

Throughout the corn belt in the Middle West there is a disposition on the part of the farmers to buy. This tendency on the part of this enormous potential market is taking hold slowly, but is noticeable and growing steadily. This condition is particularly encouraging in the Northwest.

There are reports from spots in the rural sections where buying is at a standstill caused, it is said, by the fact that country banks have begun to realize on the farmers' notes they have been holding. With all conditions taken into consideration farmer trade is on the increase and by early fall it is thought this trade will have reached its climax.

AMAZON RUBBER OFFERS PLAN

AKRON, June 27—The Amazon Rubber Co. has asked its creditors to accept 75 per cent of their claims in full settlement. The proposal is for payment of 10 per cent in cash and 5 per cent each month thereafter until the amount is paid. If this plan is not accepted it is understood that the company will be forced into bankruptcy.

G. M. C. DECLARES DIVIDEND

NEW YORK, June 30—Directors of the General Motors Corp. at a meeting this afternoon declared the usual dividend of 25 cents a share on the common, $1.50 a share on the 6 per cent preferred and the 6 per cent debenture, and $1.75 a share on the 7 per cent debentures. The resignation of R. H. Collins as a vice-president and director was accepted, and Fred J. Fisher was elected a vice-president and director.

HORSES IN CITIES SHOW BIG DECREASE

WASHINGTON, June 28—The Bureau of the Census, Department of Commerce, announces that 56,539 horses were reported in the city of New York at the census of 1920, as compared with 128,224 reported at the census of 1910. There has been a similar marked decrease in the number of horses in all the principal cities in the United States so far as heard from. Chicago had 30,388 horses in 1920, as compared with 68,122 in 1910; Philadelphia, 19,472 in 1920 and 50,461 in 1910. In Baltimore the number of horses reported at the censuses of 1920 and 1910 was respectively 7378 and 15,346; in Boston, 10,093 and 23,007; in Pittsburgh, 6032 and 12,845; in Cincinnati, 5031 and 13,901; in Cleveland, 4924 and 16,839.

Barton Axle Company Goes Into Receivership

MILWAUKEE, June 27 — Henry J. Griessel, cashier of the State Bank of Barton, Wis., has been appointed receiver of the Barton Axle Co. of the same place, on the application of a number of local creditors. Within the last 18 months the corporation was organized and promoted, and built and equipped a plant to manufacture passenger car and motor truck axles. The complaint recites that the concern sold between $400,000 and $500,000 of capital stock supposedly to return 8 per cent, but that these shares have since proved to be worthless.

It was to have sold its product through the American Axle Co. of Chicago, at a large profit, but the American company never was actually organized, it is declared. When the Barton company set out to dispose of its own production, it was found that the axles were not salable, the complaint says. The County Court at Fond du Lac, Wis., which heard the complaint on a change of venue from Washington County, denied the request of the officials of the corporation for more time to straighten up accounts and general affairs, and a receiver was then appointed.

ANTIGO BUILDS NEW TRACTOR

ANTIGO, WIS., June 27—The Antigo Tractor Corp. expects to complete the first model of a new design of the Antigo Quad-Pull tractor on July 15, and have the first ten commercial machines ready for delivery by Aug. 1. Production is being carried on at outside points pending the construction and equipment of permanent works in Antigo during the fall and winter months. Parts are being made in Milwaukee, Fond du Lac and Oshkosh, and assembled at Fond du Lac, under the personal supervision of Herman Freudenberg, general superintendent.

Hydraulic Company Defers Merger Plan

Option on Detroit Pressed Steel to Lapse Unless Directors Reconsider

CLEVELAND, June 27—Upon recommendation of the directors, stockholders of the Hydraulic Steel Co. decided to take no action on the plan for a merger with the Detroit Pressed Steel Co. This automatically holds up the proposed increase in the stock of the corporation to enable it to purchase the stock of the Detroit company, according to R. D. Mock, vice-president of the Cleveland corporation. It is understood the option on the Detroit property will be allowed to lapse but there may be another meeting.

The letter which the Hydraulic Steel Co. submitted to its stockholders stated that an option to buy the Detroit plant had been obtained. There were two provisos attached to the exercise of the option on or before July 1, as follows: "The directors are not committed to the purchase of this property and will only do so on or before July 1 provided in their judgment (a) the purchase is a distinct advantage to this company in every respect, and, (b), they believe the financial condition of the Detroit company to be such as to sustain its own operation."

Under the option obtained the local company was to deliver three shares of common stock for four shares of the Detroit corporation. This would require the issuance of 54,000 shares of common stock. It further provided that payments for the Detroit plant's 50,000 shares of series A common (second preferred) of the par value of $1,250,000 may be made by the issuance of $850,000 par value of a second preferred stock of this company. The Detroit plant's net worth is $5,100,000 from which must be deducted $600,000 of bonds and $1,500,000 of preferred stock outstanding, leaving a net worth of $3,000,000. This equity the Hydraulic company would obtain by payment of $850,000 of its second preferred and 54,300 shares of common stock. Interest requirements of the Detroit plant's bonds and preferred stock amount to $141,000 per year. Earnings have been on an average of $505,000 for 5½ years.

The Detroit Pressed Steel Co., manufactures frames, brake drums, housings and wheels. The Hydraulic Steel Co. took over and operates the plants of the Hydraulic Pressed Steel Co., this city, the Canton Sheet Steel Co., Canton, Ohio, the Cleveland Welding Mfg. Co., and the Hydraulic Steel Craft Co., this city.

BRAZIL RUBBER EXPORTS DROP

WASHINGTON, June 27—April exports of Brazilian rubber amounted to 3.244,080 lb., 2,566,753 lb. of which were shipped to the United States, the remainder going to Europe. Consul George H. Bevan points out that this is a decrease of 6,292,258 lb.

Defiance Truck Gets Chinese Concession

Will Supply Trucks and Equipment Over Twenty Year Period —Arranges Financing

TOLEDO, June 25—Charles H. Kettering, president, and J. C. Ayres, general manager of the Defiance Motor Truck Co., at Defiance, near here, were in Toledo this week conferring with bankers regarding financing a large increase in the business of their company.

It was announceed earlier in the week that the truck company had secured 20-year concessions from the Chinese Government to ship trucks and automotive equipment into the far-eastern territory. All the shipments will be imported under the direct supervision of the Chinese Government.

Similar concessions have been granted to great American companies manufacturing textiles, locomotives, agricultural machinery and other products.

During the life of the concession it is believed that the Chinese Government will take a share in the profits of the business rather than any duty charge on the products imported.

The details of the financing scheme have not been announced yet. It is hinted, however, that the Chinese Government will float a bond issue of $100,000,000 in this country to carry out the program.

The Defiance Truck Co., however, is planning on sending thousands of trucks to China as its part of the plan.

Financiers in Detroit and Cleveland, as well as Toledo, will probably be appealed to for help in the project.

Peruvian Business Best in Car Parts

LIMA, PERU, May 31 (By Mail)—Business in automobiles in Lima is a little more lively on account of the approach of the 100th anniversary of Peruvian Independence (to be celebrated the latter half of next July) than it otherwise would be under existing conditions.

Existing conditions consist of a currency that has lost in exchange value from one-third to one-quarter of its purchasing power; and a public without money to buy on account of the fall in the price of cotton, wool, sugar and copper, the chief products and exports of the country.

Very few automobiles are being imported on account of the unfavorable exchange. In addition there is talk of a scientific revision of the tariff, which makes merchants doubly cautious about buying. Then there is expectation of price reduction of automobiles in the United States.

At the present time in Peru, the best market is for repair parts and repair materials. Instead of buying new automobiles and new tires, people are repairing the old ones.

Very few tractors are being sold. Not even Fordson is moving. This is due to the fact that cotton is not being planted this year, the farmers holding what they have and not producing more, in the hope of causing cotton to go up in price.

Mexico Wants Service; Used Cars Not Selling

CHICAGO, June 27—The Koehler Dean Truck Co., distributor for Federal trucks in Texas and Mexico, writing from its Tampico, Mexico branch, expresses the desire to correct the impression that there is a lively market for used cars in Mexico.

"Mexico is a very poor market for used cars," says the letter. "It is nearly impossible to sell any make of cars that are not well represented by a good stock of parts and a service station. Many dealers are bringing automobiles and trucks to Mexico and selling them at a great loss. Lack of service is the big question. Where parts stocks are kept cars and trucks sell readily. Mexican, people who are able to buy machines usually want something high class and brand new."

Exchange Helps Renault Undersell in Sweden

WASHINGTON, June 27—Dealers in American automobiles in western Sweden are much concerned over the activity of the French motor car industry in Sweden, according to a report from Consul Walter H. Sholes, Goteborg. The low value of the French franc has made it possible for the Renault company to place in the Swedish market a four-seated 22-horsepower car with self-starter, electric lights and other modern equipment at 8000 kroner. The cheapest American car of the same class cannot be sold for less than 12,000 kroner. Automobile dealers insist that the Renault product is not of the high pre-war standard.

Renewed activity on the part of German motor car manufacturers also is in evidence. The Benz concern is entering upon an advertising campaign, and it would seem that dealers in Benz cars are financially supported and given large credits by the Benz factory.

DELCO MAKES GAINS IN FRANCE

PARIS, June 12 (By Mail)—Delco lighting and starting equipment is now built completely in the factory of the Continsouza company at Levallois, near Paris, for the French and Continental Europe markets. The annual report of this company, which holds Delco licenses for the Continent of Europe, declares that despite the general trade depression prospects are bright for Delco ignition. Even in France, where the magneto appeared to have an unassailable position, battery ignition is making considerable headway and the Delco system is being used on several high grade cars.

Emerson Sentences Are Upheld by Court

Promoters Must Serve One to Seven Years for Fraudulent Stock Sale

NEW YORK, June 27—The United States Circuit Court of Appeals has affirmed the convictions in June, 1918, of Nicholas Field Wilson, Robert T. Matches, William Loomis and C. R. Berry & Co. for using the mails to defraud in connection with the sale of stock in the Emerson Motors Co. It was charged that $1,500,000 was realized by boosting to $7 a share stock that had been bought for 17c. a share. The company was shown to have a plant worth not more than $100,000.

Wilson, who was the promoter, was sentenced to seven years in prison, while Matches, who handled the stock in Boston, was sentenced to three years. Loomis was given one year and Berry & Co. was fined $13,000. Since their conviction the defendants have been at liberty on bail.

The original allegations of the stockholders who filed a petition for a receiver in bankruptcy were that the company was originated as a "stock jobbing scheme." At the time the petition was filed the liabilities were "far in excess of $500,000."

The promoters of the company claimed they intended to manufacture a car which would sell at retail for $395, and that they had orders for 60,000 cars. It was asserted in October, 1916, that a plant had been purchased at Kingston, N. Y., and that 500 cars would be built that year with 30,000 in 1917. Manufacture really was begun on a small scale, but no dealer contracts were made.

The car was designed by R. C. Hupp, who formerly was with the Hupmobile Co., but he retired as vice-president and general manager before the affairs of the company were taken to the court.

COURT RETURNS LIQUOR CAR

INDIANAPOLIS, June 27—Restoration of an automobile to Otto S. Wilson of Chicago was ordered by Judge Geiger in Federal court this week. It had been confiscated by revenue agents when James Schaller of Chicago was arrested charged with illegal transportation of liquor. Evidence placed before Judge Geiger was that the revenue agents had turned the car to their own private and official use. He gave a severe reprimand to the agents in ordering the car restored to Wilson, who proved his innocence of complicity. Wilson is suing the revenue agents for $700 damages to the car while in their possession.

STUTZ OFFICIAL DIES

INDIANAPOLIS, June 28—Announcement is made of the sudden death of Maynard Chase, 53 years old, employment manager of Stutz Motor Car Co.

NEW CAR PRICES

BRISCOE MAKES $200 CUT

JACKSON, MICH., June 27—A cut of $200 on all models, effective July 1, is announced by the Briscoe Motor Corp. Cars at the new prices will be equipped with windshield wings, front and rear bumpers, running board pads and nickel radiators, if desired. The new prices are: Touring car and roadster $1,085, coupé and sedan $1,685, panel type delivery $1,160, screen type delivery $1,085. Prices are f.o.b. Jackson.

NATIONAL MAKES BIG CUT

INDIANAPOLIS, June 27—Price reductions ranging from $760 to $960, effective July 2, are announced on its various models by the National Motor Car & Vehicle Corp. The schedule of new and old prices follows:

	Old Price	After July 1, '21
Seven-pass. Touring.	$3750	$2990
Four-pass. Phaeton..	3750	2990
Two-pass. Roadster.	3750	2990
Four-pass. Coupe....	4900	3990
Seven-pass. Sedan...	4950	3990

STEPHENS SALIENT SIX CUT

FREEPORT, ILL., June 27—Price reductions running as high as $600, effective July 1, are announced by the Moline Plow Co. on all models of the Stephens Salient Six. The schedule follows:

	Old Price	New Price
92 Roadster.....	$2400	$1900
B-92 Roadster (Sport)....	2600	2000
94-B-94 Four Passenger Touring	2400	1985
94-A Four Passenger Touring (Sport).....	2600	2085
96 Six Passenger Touring	2400	2065
93 Four Passenger Sedan	3400	3100
95 Seven Passenger Sedan	3400	3100

LIBERTY PRICES REDUCED

DETROIT, June 28—The Liberty Motor Car Co. announces price cuts on all models effective July 1. The touring car and roadster are reduced from $1,795 to $1,595; the sport model from $1,985 to $1,675; the coupé from $2,825 to $2,400; and the sedan from $2,850 to $2,495.

STUTZ PRICES DOWN $650

INDIANAPOLIS, June 27—A reduction of $650 on all models is announced by the Stutz Motor Car Co., effective immediately. The roadster and "bearcat" models are cut from $3,900 to $3,250 and the four and six passenger open types from $4,000 to $3,350.

BARLEY MOTORS CUTS PRICE

KALAMAZOO, MICH., June 29—Cuts ranging from $100 to $650 effective July 1, were announced to-day by the Barley Motor Car Co. on its various models. The reductions follow: Four passenger touring from $3,250 to $2,985, roadster and four passenger sport from $3,375 to $3,150, seven passenger touring from $3,400 to $3,250, four passenger coupé from $4,250 to $3,985, five passenger sedan from $4,250 to $4,100; five passenger limousine from $4,500 to $4,000, five passenger landaulet from $4,650 to $4,000.

COLE CUTS $455 to $700

INDIANAPOLIS, June 29—Price reductions ranging from $455 to $700 on its different models were announced today by the Cole Motor Car Co. The new prices of the various models were not disclosed.

HATFIELD CAR REDUCED

NEW YORK, June 27—Cortland Cart & Carriage Co., Sidney, N. Y., manufacturer of the Hatfield car, has reduced prices on its 4-pass. model from $1,695 to $1,495, and on its sedan from $2,595 to $2,395.

HUBER CUTS TRACTOR PRICE

MARION, OHIO, June 27—The Huber Mfg. Co. has made a reduction of $200 in the price of its light four tractor. This takes the price back to the pre-war level.

MILLER CUTS TRUCK TIRES

AKRON, June 27—New prices on heavy duty pneumatic tires are announced by the Miller Rubber Co. The new schedule, as compared with the old, follows:

Size	Old Price	New Price
36 x 6	$119.35	$91.85
38 x 7	168.85	127.35
40 x 8	217.50	164.00
42 x 9	272.25	262.50
44 x 10	380.75	367.00

FORD CUTS PARTS PRICES

DETROIT, June 28—The Ford Motor Co. announces price reductions on parts ranging from 12½ to 50 per cent. The reductions cover more than 400 parts and in dollars and cents range from 1 cent on nuts and bolts to $12 on transmission assemblies.

Small Buying Continues in General Motors Stock

NEW YORK, June 29—One out of every five General Motors common stockholders is a woman. On April 15, 1921, there were 8110 women common shareholders compared with 3459 on Oct. 5, 1920, an increase of 4651. Women owned 1,467,368 shares of common April 15, an average holding of 180 shares each, compared with 1,201,334 shares Oct. 5, 1920, an average of 347 shares; an increase of 266,834 shares in the aggregate, but a decrease of 167 shares in the average.

On April 15, the date of record for stockholders who received May dividends, there were 37,787 individual common stockholders, compared with 16,681 on Oct. 5, 1920, the date of record for November, 1920 dividends. The changes during those six months are significant.

METAL MARKETS

STEEL consumers have grown unduly accustomed to the "official" method of price changes. This is a legacy of the War, when the War Industries Board, "with the approval of the President," would issue proclamations covering maximum prices, and these were considered first page stuff by the newspapers. Popular interest in the leading steel producing interests, because it is the largest industrial corporation of the land, continues to make price announcements by the United States Steel Corporation "must, first page." Important changes in the price of steel products, however, are coming to pass these days without being deemed worthy of scareheads. This is especially true of the kinds of steel in which the automotive industries are vitally interested. Cold-rolled strip steel is obtainable at fully $10 a ton less than a month ago. A similarly sharp price decline has taken place in fine-finished sheets. All of these downward price changes, however, fail to arouse any enthusiasm on the part of the buyer, who holds that they result from apathy on the part of the leading steel producers, who are permitting the market to drift, when, in the consumer's opinion, they should set their house in order as speedily as possible and announce the lowest possible price at which they can sell steel and make both ends meet. In spite of the seemingly lackadaisical attitude of steel producers, a change is coming over the situation, however, and, with production down to a quarter to a third of normal, the visible supply of steel is being constantly diminished. The major market in the last few weeks has been the resale market. Manufacturers with much steel and few orders on hand have been disposing of as much of their surplus as they possibly could to other manufacturers with a more immediate outlet for it. Jobbers have in some instances reduced their prices to a point where they could compete successfully with production steel. Daylight is beginning to dawn more and more. For all that, the belief is general that before long the leading interest will see fit to announce a reduction in prices. This impression is strengthened by the sharp criticism which one of the independent producers recently applied to the chief interest's price policy. The new iron ore price, which is $1 a ton below the 1920 level, is merely a trial kite. It looks as though 1921 ore demand would be negligible. The new ore price was established on the basis of a sale to Canada. There have been no domestic transactions at the new figure, nor are there any in sight. Theoretically speaking, $1 cut in the price of ore should imply a $2 per ton reduction in production cost of pig iron and steel.

Pig Iron.—Malleable is offered at $23, valley, and foundry $1 less. Even these low prices can be frequently shaded.

Steel.—Automotive parts makers are placing occasional orders for cold-drawn bars. Youngstown reports 5.20c. for fine finished sheets with 15 per cent seconds for 22 gage.

Aluminum.—The market continues utterly neglected, although some automotive interests are endeavoring to obtain a line on contract prices for 1921-1922 delivery.

Lead.—Spanish lead continues to come in. In the "outside" market metal as low as 4.05c., East St. Louis basis, is offered.

Zinc.—In the absence of consuming demand, the market is continually sagging with the nominal price at around 4.25c., East St. Louis.

FINANCIAL NOTES

Standard Parts Co. business totaled $600,000 in March, $1,000,000 each in April and May, and will aggregate $600,000 in June, according to a statement issued by Receiver Scott. All the receiver's debts have been paid excepting current accounts, and the company has $1,000,000 in the bank.

Miller Rubber Co., in a comparative balance sheet as of Dec. 31, shows total assets of $23,271,274, a gain of about $5,000,000 over 1919. The assets include cash of $2,012,388; accounts and notes receivable, $2,755,327, and an inventory of $9,321,803.

Chandler Motor Car Co. is in strong financial position, declares President F. C. Chandler, decrying rumors that the company would cut its October dividend. "Directors will not discuss the October dividend in June," he said.

Cincinnati Finance Co. moved last week into its permanent offices in the Dixie Terminal Building, Cincinnati. The company specializes in discounting automobile and truck installment payment notes from dealers.

Detroit Motorbus Co. has declared a dividend of 1½ per cent, payable July 15. This will be the first dividend since the company was organized. It now has 48 buses operating and 20 more soon to start.

Jackman Motors Co., Joliet, Ill., has been cited in a petition in bankruptcy filed by creditors. Liabilities are placed at $70,000 and assets at $60,000.

Kelsey Wheel Co. has declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable August 1.

Republic Motor Truck Co. directors have voted to pass the 1¾ per cent quarterly preferred dividend due July 1.

Motor Wheel Corp. paid a cash dividend on common stock of 2 per cent on June 20.

HOLTON TO CHANGE HANDS

INDIANAPOLIS, June 27 — Contract for the transfer of the Holton Tractor Co. of this city to the Kokomo company which will take over the tractor company's business will be effected as soon as Elwood Haynes of the Haynes Automobile Co. returns from New York. Negotiations for the transfer are being carried forward with the receiver here. The transaction will involve approximately $350,000. The Holton tractor company will probably be moved to Kokomo and it is understood that the strong features of a tractor manufactured at Elwood will be combined with the Holton invention. Others interested in the new company besides Haynes are A. G. Seiberling, George J. Marott of Indianapolis, Simeon McQuiston of Greentown and others.

MONARCH TRACTOR PLANT SOLD

WATERTOWN, WIS., June 27—E. D. Caldwell of New York was the highest bidder for the assets of the Monarch Tractor Co. of Watertown, Wis., at the public auction conducted at the plant by the trustee in bankruptcy, William B. Roys of Madison, Wis. The price of $44,000 was accepted subject to approval by the bankruptcy court. The Monarch company, together with its parent corporation, General Tractors, Inc., Paulsboro, N. J., recently was made defendant in bankruptcy proceedings and the entire properties were ordered sold. Caldwell is a large stockholder in the General Tractors company and a principal creditor as well. The Monarch plant at Watertown is carried for 1921 on the assessment roll of the city of Watertown at a valuation of $168,000. Inventory appraisal in bankruptcy proceedings gave the value as $40,000.

INDUSTRIAL NOTES

American Grinder Mfg. Co., manufacturer of wrench sets, portable tool grinders and similar specialties, is moving into a new factory, comprising the entire second floor of the Milwaukee Terminal Building, affording about 50,000 sq. ft. It will be ready to resume operations July 1 or 5 in the new quarters.

Link-Belt Co. of Chicago, headed by Charles Piez, has acquired all the capital stock of the H. W. Caldwell & Son Co. Frank C. Caldwell has been elected a director by the Link-Belt Co. and operation of the Caldwell plant as a separate unit will be continued.

John Broenen Co., Milwaukee, has let contracts for the erection of a two-story brick and concrete addition, 50 x 75 ft. It is a manufacturer of passenger car and motor truck bodies.

Hebb Motors Works at Havelock, Neb., were sold at auction to W. H. Ferguson of Lincoln for $110,000, subject to the approval of the court. The plant cost $3,000,000.

Paige-Detroit Motor Car Co. has declared the regular quarterly dividend on preferred stock of 1¾ per cent, payable July 1 to stock of record June 15.

Kant-Score Piston Co. has acquired the Cincinnati plant of the D. T. Williams Valve Co.

Cadillac Tool Co. has increased its capital stock from $40,000 to $200,000.

JORGENSON RESUMES JULY 1

WAUPACA, WIS., June 27—The Jorgenson Mfg. Co., a large manufacturer of priming devices and brass castings for the automotive industries, will resume production on a normal scale shortly after July 1. The machine shops were closed late in May after a steady day and night run for nearly a year's time to enable the company to overhaul the plant, rearrange equipment for greater efficiency and to do some retooling. The foundry was kept in continuous operation to insure a casting supply when the machine departments resume. The interruption was a seasonal one, as demand for priming devices usually falls off after the cold weather is over. Manufacturers and jobbers are now placing orders for fall and winter deliveries and it is expected to maintain steady production for a year.

CAROLINA WOODWORK HIGH

COLUMBIA, S. C., June 25 — South Carolina now has more miles of Federal aid highways completed or under construction than any of the five Southern States, Tennessee, South Carolina, Georgia, Florida or Alabama, with the exception of Georgia.

BANK CREDITS

Written exclusively for AUTOMOBILE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, June 30—The improvement in the reserve position of the New York Federal Reserve Bank attracted much interest last week. The ratio of gold reserves to Federal Reserve notes in circulation after setting aside 35 per cent against deposit liabilities, increased from 90.8 per cent to 103 per cent. The ratio of total reserves to deposit and Federal Reserve note liabilities combined, increased from 60.6 per cent to 68.9 per cent. This improvement was largely a result of a $132,682,000 decline in total deposits and a $25,106,000 increase in gold reserves. Federal Reserve notes in circulation in this district also declined $13,541,000. This improvement furnishes substantial background for the further reduction from 6½ per cent to 6 per cent of the bank's discount rate on commercial paper. Similar action was taken by the Dallas Federal Reserve Bank, and, as a result, all Federal Reserve Banks of the system now have a 6 per cent rate on commercial paper, with the exception of the Minneapolis and Chicago banks, which still maintain a 6½ per cent rate.

The action of the New York bank was followed by similar action on the part of the Bank of England, which reduced its discount rate from 6½ per cent to 6 per cent on June 23, after having reduced it a short time ago from 7 per cent to 6½ per cent. The effect of the reduction by the Bank of England on trade has apparently been minimized somewhat by the continuance of the coal strike. This strike was settled on June 28 and should allow England to proceed uninterruptedly towards a normal recovery of its economic life. There appears to be ample evidence that the banking situation is laying the foundation for easier credit in the future.

The local call money market gave evidence of considerable ease last week when the renewal rate reached 5 per cent on the Stock Exchange for the first time since October 27, 1919. The range for the week was 5 per cent to 5½ per cent as against 5½ per cent to 6 per cent the previous week, although 5 per cent was the maximum rate on all days except Monday. There were said to be large supplies of unloadable funds at the end of each day for which no market was found, and on the "outside" market considerable business was done at 4 per cent. Time money was unchanged at 6½ per cent for 60 and 90 days' and 4 months paper, and 6 per cent to 6½ per cent for 5 to 6 months' paper. There was little activity and most of the trades were restricted to renewals for short periods. The commercial paper market was dull, with rates unchanged at 6½ per cent to 6¾ per cent for 60-90 days' endorsed bills and 6 months' names of prime character.

The market continued the decline characteristic of recent weeks.

MEN OF THE INDUSTRY

Earl B. Spencer has been appointed production manager of the Leach Biltwell Motor Car Co., Los Angeles. He was formerly a plant engineer at the Pierce-Arrow factory and later assistant general superintendent. During the war he was in charge of the organization manufacturing Hispano-Suiza aircraft.

D. F. Hulgrave has been appointed manager of purchases for the Cadillac Motor Car Co., succeeding J. H. Main, who has been named director of the purchase section of the General Motors advisory board in Detroit. Hulgrave has been with the company for thirteen years, the latter three being assistant to Main.

John A. Cleary has resigned as advertising manager of the Cadillac Motor Car Co. to become advertising manager for the new Collins car. Cleary has been with Cadillac for a number of years, serving as sales promotion manager with the Philadelphia distributor before making the factory connection.

M. J. Flannery, formerly of the General Motors Export Corp. and the John N. Willys Export Corp., has been named assistant export manager for the Haynes Automobile Co. His office will be at 1715 Broadway, from which all foreign sales of the Haynes, except in Mexico, will be handled.

L. M. Rankin, vice-president and general manager of the Duesenberg Automobile & Motors Co., has appointed Harry W. Anderson as general sales manager of the company, with headquarters at the new Duesenberg plant in this city. He will begin upon his duties immediately.

R. S. Schaap, sales manager of the Schaap Co., Brooklyn, has left on a western trip, on which he will inspect several locations as the site of the company's proposed western plant. He will also appoint a number of western distributors for his company's products.

Thomas Mair, former comptroller for the Chevrolet company, has been transferred to the Oakland Motor Car Co., where he will succeed E. H. Tinsman, who has been transferred to the general comptroller's office of the General Motors Corp. at Detroit.

Frederick C. Horner, for several years transportation engineer of the Packard Motor Car Co., New York, is leaving the company to spend two years in Europe studying transportation practice in England, France, Belgium and Germany.

F. R. Robinson, secretary of the Packard Motor Car Co., has assumed also the duties of treasurer. He has been in the Packard organization for the past twelve years, holding successively the positions of auditor, comptroller and secretary.

W. B. Kelly, for 13 years works manager of the Oakland Motor Car Co., has resigned. He states that he has no definite plans for the future, but it is presumed he will join the Durant forces.

H. R. Hyman has resigned as advertising manager of the Cole Motor Car Co., Indianapolis. He will rest for several months before announcing plans for the future.

C. B. Rice, New York, who has been manager of exports for the Hamilton Motors Co., will also assume control of domestic sales of the company.

J. K. Harness has resigned as patent counsel for the Ford Motor Co. to resume private practice.

J. G. White has been appointed district sales manager at Detroit of the Sharon Pressed Steel Co., Sharon, Pa.

OTTAWA CAR BUILDER DIES

W. W. Wylie died here June 24 at the age of 61. He was for twenty years manager of the Ottawa Car Co. and manufactured the first street cars to run in the city as well as the first snow plows for use in clearing street-car tracks in winter. He built and ran the first motor car to speed through the city in 1894, the seat being pitched high on four very heavy solid wheels and the electric motor fitted to the box under the seat. The trial spin was the cause of much interest and amusement to pedestrians who watched the rather uncertain movements with some misgiving. In 1912, Mr. Wylie resigned the managership of the company which was later incorporated and now operates one of the best motor showrooms in the city as well as a large repair department.

INVENTOR SUES VAN BRIGGLE

INDIANAPOLIS, June 27—Suit has been filed in Circuit Court by George G. F. Boswell, inventor, asking for an injunction restraining Lilburn Howard VanBriggle of the VanBriggle Motor Device Co. and promoter of the interests of several manufacturing concerns of this city from making or selling shock absorbers or parts of shock absorbers.

Boswell charges in his complaint that he entered into an agreement with VanBriggle, April 12, 1918, for handling and making shock absorbers, on which he held patent rights. Full patent letters on the shock absorber were received in December, 1919, but since that time no shock absorbers have been manufactured by VanBriggle, and notice was served on him April 21, 1921, of the cancellation of the contract, according to Boswell. In the complaint, Boswell charges that VanBriggle is making the shock absorbers and he has, therefore, asked that such a restraining order be issued.

NEW PATENT BILL HELD UP

WASHINGTON, June 27 — Efforts to amend the patent law providing that foreigners shall within two years manufacture the article in the United States, or, in the discretion of the department, some other person may be granted a license to manufacture it, failed to pass the Senate to-day on objection of Senator Brandegee of Connecticut. His objection was based upon the protest of Frederick P. Fish, of Boston, a patent lawyer well known in the automotive trade, who declared that the amendment was dangerous because it established a precedent and opened up the question of a time limit upon when the granting of a patent must result in putting the article or commodity so patented upon the market. The Senate committee on patents has asked the views of the Commissioner of Patents and the Secretary of War before considering the bill in open session.

Truck Auction Bids Appear Fictitious

(*Continued from page* 1453)

for $2,500; 3½-ton Packards sold for $2,000; chain-driven 3-ton Whites for $1,900; and 4-ton Rikers for $1,800.

In the opinion of prospective buyers on the floor, to-day's prices did not indicate anywhere near the true valuation of the trucks. A representative of one of the large truck manufacturers stated that his company was given the opportunity to purchase a certain make of truck in lots for $350 each.

Each truck was sold with a guarantee against defective parts within 30 days of the purchase. Arrangements were made by the auctioneers for the sale of the trucks under the part payment plan, representatives of finance companies being on the floor.

OLDSMOBILE REVISES PRICES

NEW YORK, June 30—Price reduction on several models of the Oldsmobile, ranging from $45 to $575, and increases on two models, will be effective July 2. There will be reductions all along the line on the Model 43-A, the 4-cylinder car, and on the Model 46, big 8-cylinder. On the light 8, Model 47, the coupe is reduced, while the sedan is increased $30 because it could not be built at a profit at the old price. The light 8 touring car, a four-passenger job, is increased $30 because of the change from fabric to cord tires.

Prices of the 6-cylinder model will be unchanged.

PREMIER PRICES SLASHED

INDIANAPOLIS, June 30—The Premier Motor Car Corp., beginning July 1, will cut the prices of its cars from $710 to $910. The reductions are: Four-pass. touring from $4,600 to $3,690; 4-pass. sedan from $6,000 to $5,090; 7-pass. touring from $4,600 to $3,890; 7-pass. sedan from $6,100 to $5,190, and coupé from $5,600 to $4,690. There will be practically no changes in design and construction of the 1921 model.

WESTCOTT PAYS DIVIDEND

SPRINGFIELD, OHIO, June 29—Directors of the Westcott Motor Car Co. and the H. G. Root Co., automobile supplies, have authorized the payment of the regular quarterly dividend of 2 per cent on the preferred stock payable June 30.

BURY SHIFTS JOBS

DETROIT, June 29—G. R. Bury, general sales manager of the Packard Motor Car Co., has resigned on account of ill health and will go to Los Angeles to become associated with the Packard distributor in that territory. His successor has not been named.

Calendar

SHOWS

Sept. 5-10—Indianapolis, Automobile and Accessory Show in conjunction with Indiana State Fair, conducted by Indianapolis Automobile Trade Association, John B. Orman, Mgr.

Sept. 28 - Oct. 8 — New York, Electrical Exposition, 71st Regt. Armory, Electric Equipment, Machinery and Vehicles.

Nov. 27-Dec. 3—New York, Automobile Salon, Hotel Commodore.

January — Chicago, Automobile Salon, Hotel Drake.

FOREIGN SHOWS

September—Buenos Aires, Argentina, Passenger Cars and Equipment. La Pabellon de las Rosas. Automovil Club Argentino.

September—Buenos Aires, Argentina, Cars, Trucks, Tractors, Farm Lighting Plants and Power Farming Machinery. Palermo Park; Sociedad Rural Argentina.

September—Luxemburg, Luxemburg, Agricultural Sample Exhibition.

Sept. 23-Oct. 2—Berlin, German National Automobile Show, Auspices of German Automobile Mfg. Ass'n and German Automobile Club.

Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

Nov. 4-12 — London, British Motor Show, Society Motor Mfrs. and Traders.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

CONVENTIONS

July 4-9 — Mackinac Island, Mich., Summer Meeting Automotive Equipment Association.

Oct. 12-14, 1921 — Chicago, Twenty-eighth Annual Convention National Implement & Vehicle A'ssn.

Nov. 22—New York, Convention of Factory Service Managers, National Automobile Chamber of Commerce.

Dec. 27-29—Chicago, American Society of Agricultural Engineers, Auditorium Hotel.

RACES

July 25—Grand Prix, Le Mans.

Labor Day—Uniontown, Pa., Autumn Classic.

Mixed Fuel Exempted from French Gas Tax

PARIS, June 12 (By Mail)—Gasoline mixed with alcohol or with benzol is now exempt from the French State tax of 20 centimes per litre. The decree declares that the mixture can be either 50 per cent alcohol and 50 per cent gasoline, or a mixture in equal proportions of gasoline, alcohol and benzol.

The French State gasoline tax initiated last year, always has been very unpopular and has brought forth innumerable protests from both manufacturers and automobile users, without, however, moving the authorities. All the big trucking interests are in favor of the use of a fuel composed of gasoline, alcohol and benzol, which experiments have shown can be satisfactorily employed in present engines. To get this on the market, however, it is essential that the price of the mixture should be lower than straight gasoline, and this has not been possible up to the present owing to the instability of alcohol prices and variations in the supply. The abolition of the State tax is a certain step in the direction of the adoption of this mixture.

As a further effort, a competition is now announced, with $50,000 in cash prizes for devices which will encourage the use of alcohol in internal combustion engines. Agricultural experts are also at work endeavoring to convince farmers of the advantage of occasionally raising beet crops in order to improve their land for wheat crops. The beets will be used for distilling alcohol, and at the same time the yield in wheat will be increased, it is declared, from 20 to 30 per cent.

Plane Service Connects Paris with Le Havre

PARIS, June 12 (By Mail)—Regular airplane service between Paris and Le Havre, a distance of 130 miles will be established this week in order to carry passengers to and from Atlantic liners using this port. This airplane service is being organized by the Compagnie des Messageries Aeriennes in conjunction with the French Line steamship company, whose liners sail from this port.

A protest has been made by the French aerial navigation companies against the Government plan of forming elaborate aerial stations, with sheds, equipment, and an expensive staff, on the main aerial routes. The operating companies maintain that all that is required is a chain of suitable landing grounds at intervals of not less than 30 miles along the entire route between Paris and London and Paris and Brussels. On the Belgian portion of the Paris-Brussels air line this view has been accepted, and the Air Ministry is now preparing emergency landing grounds at 30 mile intervals.

Lack of Roads Hurts Car Sales in Formosa

WASHINGTON, June 28 — American manufacturers of automobiles, trucks and tractors having the best success in Formosa are those whose agents have branches there equipped to give demonstrations, according to a report by Consul Henry B. Hitchcock, Taihoku, Taiwan, Japan, relating to conditions affecting the sale of these vehicles in Formosa. It also is urged that the value of judicious advertising should not be overlooked.

He states that the market for passenger vehicles and trucks in Formosa is as yet but a small one. Roads in the rural districts are not wide enough or sufficiently well maintained to be used for motor vehicles. In the large cities, however, the streets are generally wide and well kept up. The use of passenger automobiles and trucks is consequently confined to the large cities, of which there are but three with a combined population of 270,478. While the financial depression has not been felt so much in Formosa as in Japan, it will nevertheless have an effect on the sales of passenger automobiles and trucks for some time.

NASH MAKES CUT IN SALARIES

KENOSHA, WIS., June 27—At a mass meeting of all straight-time workers in the plant and offices of the Nash Motors Co., Kenosha, Wis., it was announced that the entire salaried force would receive a slight reduction effective July 1.

South Africa to Make Gasoline Substitute

WASHINGTON, June 27 — Penrol, South Africa, Ltd., is marketing 85,000 shares of stock to secure initial working capital for the production and sale of "Penrol," a gasoline substitute, according to a report made to the Bureau of Foreign and Domestic Commerce. This new fuel will be made principally from alcohol which will be produced from locally grown maize or mealies (corn). It has been patented in the Union of South Africa and its name registered. The advantages claimed are as follows:

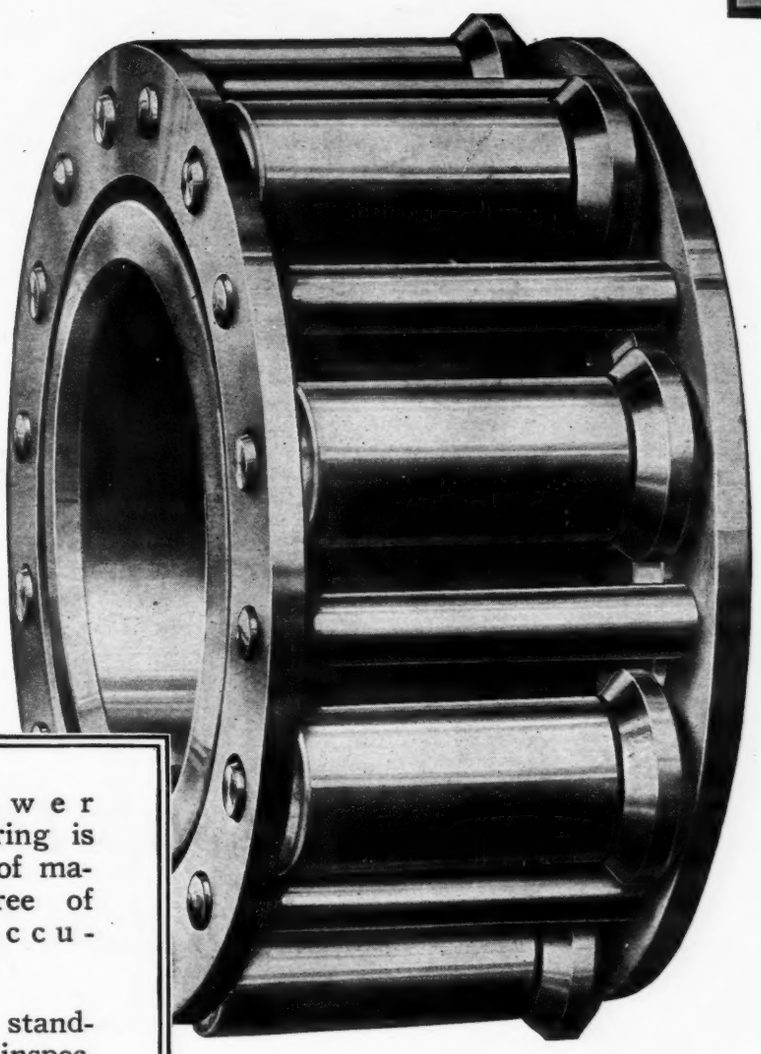
It can be manufactured in South Africa solely from ingredients and constituents produced locally; the selling price will be considerably below that of gasoline; in power and driving force it is practically equal to gasoline; it has no smell and does not carbonize; it is non-corrosive, smokeless and stainless. Penrol has been subjected to trials and experiments for a considerable period in motor cars, motor cycles, motor trucks, and airplanes over a distance of 10,000 miles, with excellent results, according to reports from experts and leading firms.

The total gasoline consumption of the Union of South Africa is estimated at 12,000,000 gal. annually by the company, but the total for the past year was only about 11,000,000 gal. By-products of cattle feeds and other lines are also contemplated.

FORD LOWERS HOUSE PRICES

DETROIT, June 28—In line with his determination to bring about price readjustments in accordance with business conditions, Henry Ford has announced substantial price cuts on Ford homes in Dearborn. These suburban residences now are selling at low figures and at terms which are making them attractive to investors who naturally are numbered chiefly among the Ford employees. Ranging between $6,900 and $8,500, according to type, prices are considerably below market value for property in this section. The terms being allowed make the offers unusually attractive, Ford permitting down payments as low as 10 per cent and monthly installments varying from $38 to $85.

CARRIES THE LOAD



TAKES THE THRUST

EVERY Bower Roller Bearing is alike in quality of material and degree of manufacturing accuracy.

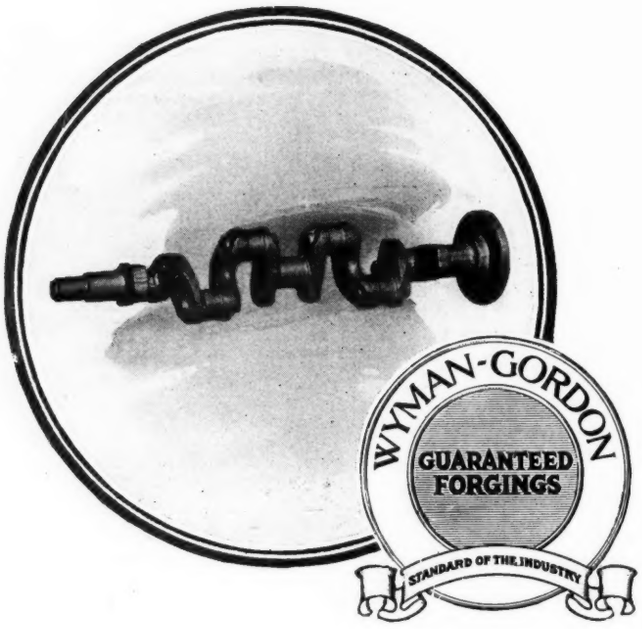
Pre-determined standards and careful inspection regulates that.

BOWER
ROLLER BEARING CO.
Detroit Michigan

Exclusive Bower Features

Separate bearing surfaces for load and thrust. Parallel raceways. Self-aligning. Never need adjusting. Does not develop end thrust under loads. Will not bind or end-slip.

BOWER SAVES POWER



There is no substitute for Wyman-Gordon Quality

WYMAN-GORDON

The CRANKSHAFT MAKERS

WORCESTER, MASS. CHICAGO, ILL. CLEVELAND, OHIO

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE
THE CLASS JOURNAL COMPANY
239 WEST 39th STREET NEW YORK CITY

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Years Without Water

Neglect—Who Pays?

Here's a battery that defies neglect —never needs water—cannot spill.

AS long as batteries are kept out of sight they will be out of mind. Neglect is inevitable.

And while neglect—the cause of practically all battery trouble—is the fault of the owner, he does not blame himself—nor the battery. He blames the car.

The "J-E" Battery needs no care.

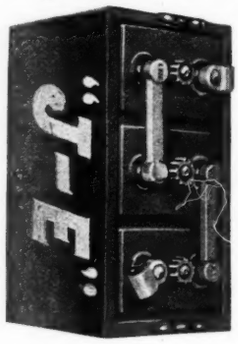
It never needs water—repairs—or attention.

Even after remaining idle for months the "J-E" Battery will spin the motor first turn.

Instead of the trouble making liquid electrolyte, the sulphuric acid jelly in the "J-E" Battery absorbs and discharges electric current as desired. It retains the current to a surprising degree for an indeterminate time.

It is guaranteed unconditionally for 18 months.

Write for literature—get further details.



The "J-E" Battery will not crystallize—nothing to spill.

The "J-E" Battery is not affected by climate or temperature — will not corrode terminals — will not sulphate—plates will not buckle—will stand more over-charging than any other battery. The "J-E" Battery will not crystallize.

Jelly-Electrolyte Battery Co., Inc.
152 West 42nd St.
New York City, N. Y.

Telephone Bryant 5745
Factory: 147 South 30th Street, Philadelphia.
Telephone Preston 1364
Distributors for the Pacific Coast
1220 Post Street, San Francisco, California.

needs less care than any other battery

"J-E" Battery

Never Needs Water

The following is reproduced from Motor World, issue of June 29th. It deals with a practice which has been tried and proved sound in other periods of stress—as well as in this one:

"The National Chamber of Commerce made a recent survey of business conditions of the country. Among other questions submitted to business men in all phases of commercial activity, an expression was requested regarding their present policy in adjusting advertising appropriations to meet prevailing demands of economy."

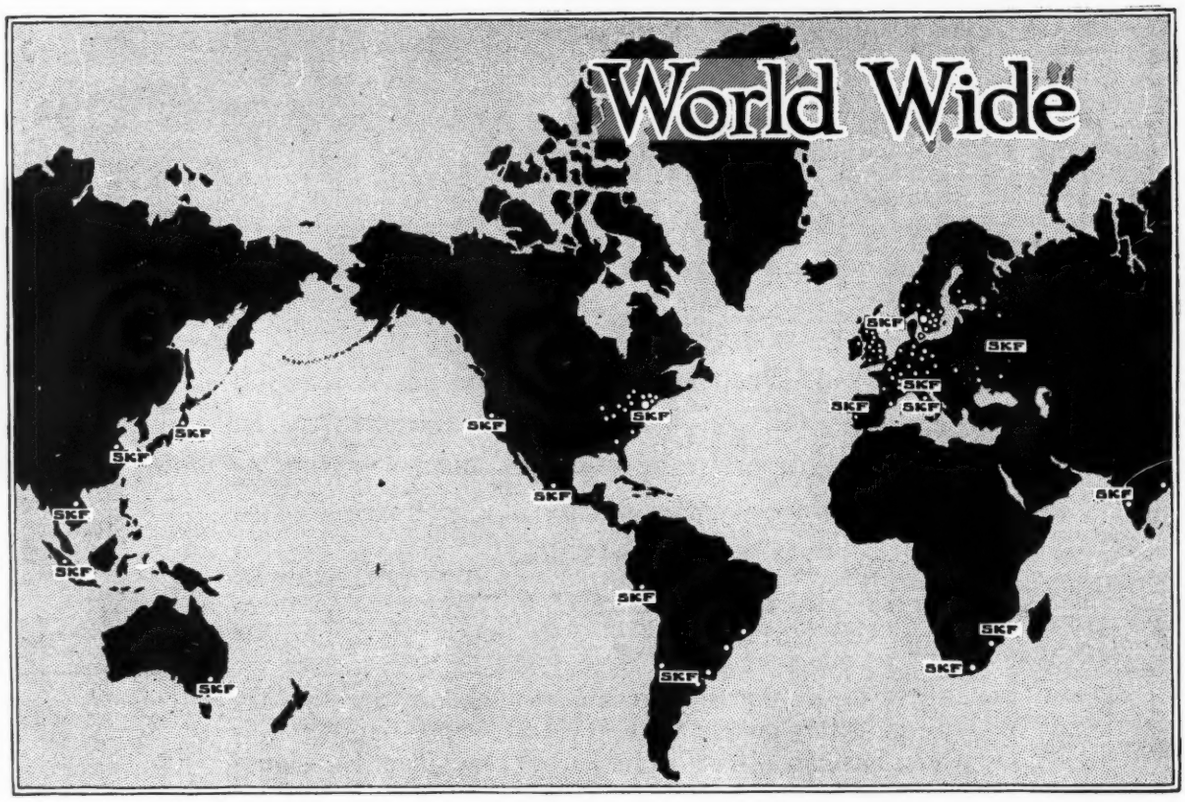
"We quote from 'Electrical World,' a composite reaction shown in answers received. As this composite develops, the following three brief paragraphs would seem to reflect a prevailing policy among those addressed:"

> 1—" 'We do not feel we should decrease publicity. Our advertising expenditure should be increased to increase our business.' "
>
> 2—" 'Cutting down advertising would only increase the cost of selling merchandise, therefore we advertise heavily when business is hard to get and go easy when it is coming anyway.' "
>
> 3—" 'We kept our advertising appropriation down to bedrock when there was practically no sales resistance, conserving our funds for harder times. We feel that we now owe it to our distributers and dealers and to ourselves to insure a healthy flow of business by consistent, well-directed, forceful advertising.' "

"Electrical World" then comments:

"Our National Chamber of Commerce has asked and the American business man has answered. It is advice for all of us. For now is a season when well-poised, full-bodied selling is needed in every industry, and no man's problem is too local or too small to be aided profitably by sensible advertising. He should give his salesmen this other voice to help them sell. They need it NOW."

The technical knowledge that comes to you from SKF engineers is



as it is the sum of the data gathered by SKF organizations in all industrial countries.

This fund of engineering information we bring to the fabrication of all products bearing the mark SKF and the operation of those industries which we are requested to supervise. In order that complete reliance may be placed in the endorsement expressed by the mark SKF it is necessary not alone that we control and supervise each step in the manufacture of a product but also its final installation.

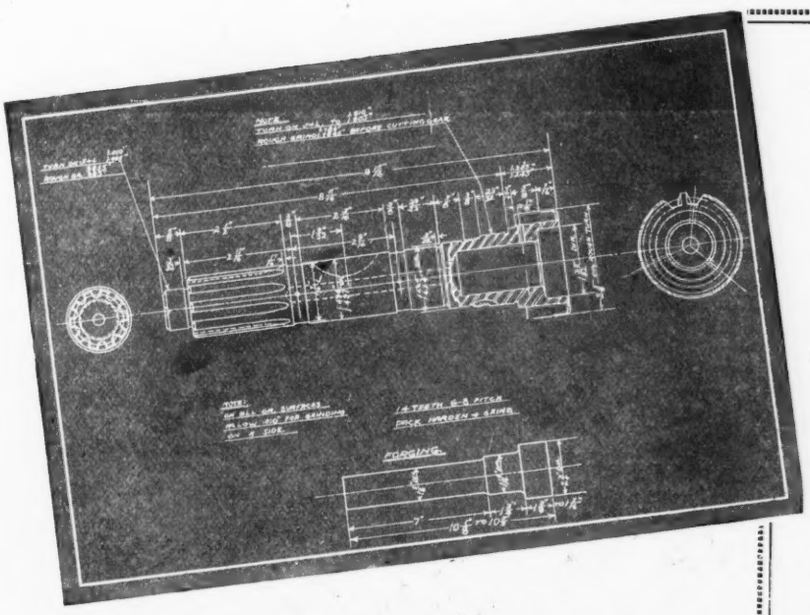
Because every effort is made to assure the most satisfactory use of products marked SKF we welcome requests for information concerning their proper application and maintenance.

Automotive engineers and manufacturers should feel that this technical knowledge is always available. You are urged to use it freely without any sense of obligation.

SKF Industries, Inc.
165 Broadway, New York City

Supervising at the request of the stockholders.
- The Hess-Bright Manufacturing Co.
- The Skayef Ball Bearing Co.
- Atlas Ball Co.
- Hubbard Machine Co.
- SKF Research Laboratory

620



The Fay Way of Machining Engine Clutch Gears

In the manufacture of such standardized automotive parts as clutch gears, flywheels, hubs, camshafts, pistons, crankshafts, and the like, the Fay Automatic 14" Lathe is the recognized production leader. The Fay Way is the practical way. Send sample pieces to our engineering department for estimates.

INVESTIGATE.

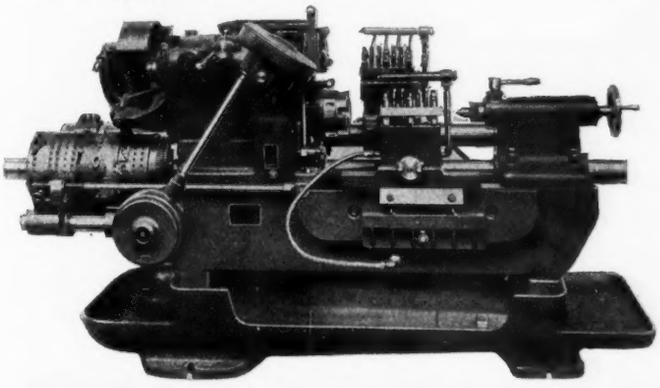
Send sample piece or blueprints for time estimate.

JONES & LAMSON MACHINE CO.
Springfield Vermont

503 Market St., San Francisco, Cal.

9-10 Water Lane, Queen Victoria St., London, Eng.

AGENTS: France, Spain and Belgium—F. Auberty & Co., 91 Rue de Maubeuge, Paris. Holland—Spliethoff, Beeuwkes & Co., Rotterdam. Japan, Korea, etc.—Mitsui & Co., Ltd., Tokio. Australia—McPherson's Pty., Ltd., 554 Collins St., Melbourne. Stockholm, Sweden—A Bol. Oscar Lindbom, Postbox 420.



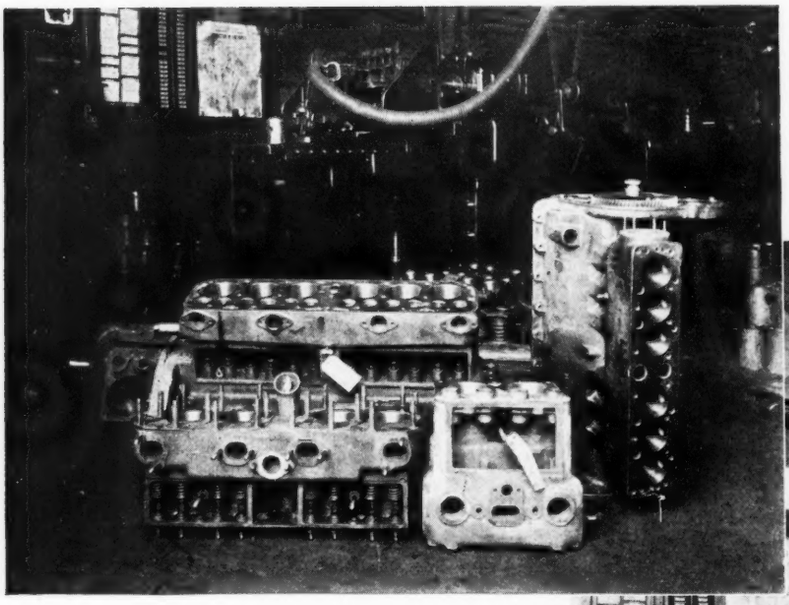
One Operator—Two Machines Production, 250 Gears Per Day

The five necking, turning and facing operations on this stem pinion are performed on two Fay Automatics, the rough turning on one machine, the finish turning to blue print size on the other.

The output by the Fay Way is equal to that of five machines and five operators when the previous method of handling the job was in force.

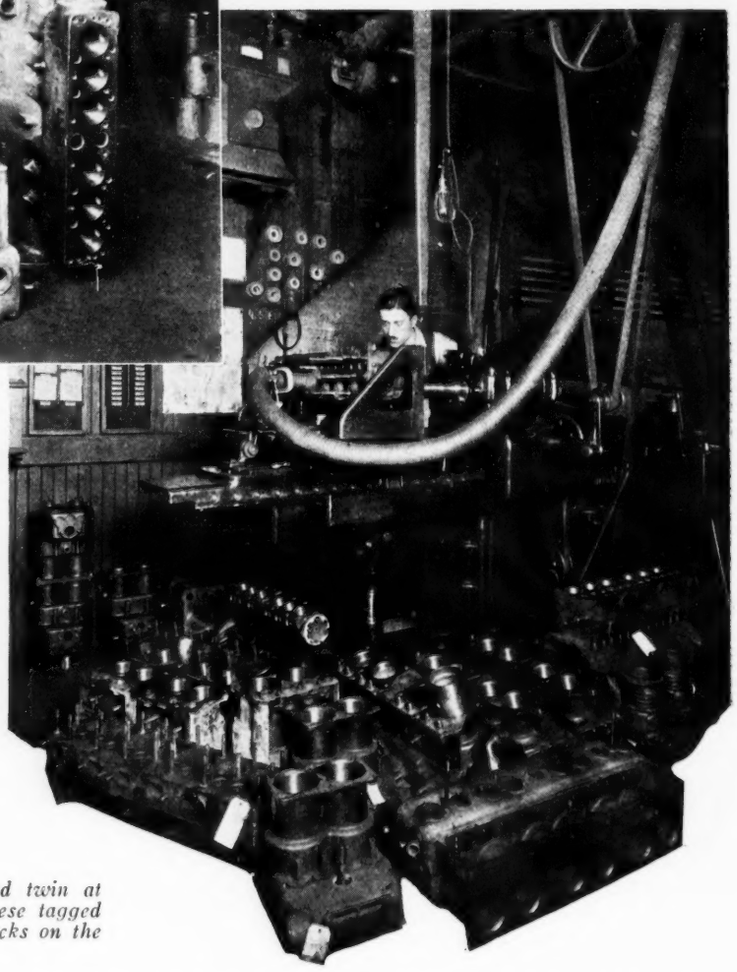
The principle of the Fay Automatic, a multiplicity of cuts taken simultaneously, has worked wonders on many a production schedule. Have you considered its possibilities on yours?

FAY AUTOMATIC LATHE



Cylinder Regrinding

The above group consists of a Mitchell six, Oakland six, Continental twin, and Cunningham eight that have just been ground on a Heald which handles automobile, marine and airplane cylinders equally well.



More Evidence In Favor of

HEALD

Regrinding the bores of a Packard twin at the Zumbach Machine Co. All these tagged cylinders will result in nice fat checks on the first of the month.

Here's another Heald at work in the shop of the Zumbach Machine Co., 134 West 54th St., New York City. There are over 500 concerns using Healds that we could call on for photographs before the list would be exhausted.

While this is a large number they cannot begin to take care of the tremendous field and possibilities of regrinding. It proves definitely that the Heald is recognized as the logical machine to take care of refinishing worn and scored cylinders.

The Style No. 55 is built especially for regrinding work. It is nominal priced, self-contained and simple with a large range and capacity.

If you have a small machine shop, auto repair shop or welding outfit, look into the regrinding field. It is the most active business in the mechanical line today. Install a Heald and clear those cobwebs out of your cash box.

THE HEALD MACHINE COMPANY

WORCESTER, MASS.

BRANCH OFFICES—New York, 839 Singer Bldg.; Buffalo, 331 Jewett Ave.; Philadelphia, 1302 Stephen Girard Bldg.; Chicago, 26 South Jefferson St.; Detroit, 401 Marquette Bldg.; Cincinnati, 311 Provident Bank Bldg.; Cleveland, 721 Engineers Bldg. Western Agents—Eccles & Smith Co., Los Angeles, San Francisco, Seattle and Portland; Salt Lake Hardware Co., Utah and Idaho; Hendrie & Bolthoff Mfg. & Supply Co., Colorado and Wyoming.

FOREIGN AGENTS—Alfred Herbert, Ltd., England; Societe Anonyme Alfred Herbert, France, Switzerland; Societa Anonima Italiana Alfred Herbert, Italy; Horne Co., Ltd., Japan; Wilh. Sonesson & Co., Sweden, Denmark and Norway; Henri Benedictus, Brussels, Belgium; American Machinery Corporation, Madrid, Spain; Sindicatio de Maquinaria Americano, Bilboa, Spain.

DOEHLER

DIE-CASTING CO.

WORLD'S LARGEST PRODUCERS OF

DIE-CASTINGS

TIN,-LEAD,-ZINC,-ALUMINUM-ALLOYS.

DO-DI BRASS.

MAIN OFFICE AND EASTERN PLANT

BROOKLYN N.Y.

COURT, 9TH AND HUNTINGTON STS.

CENTRAL PLANT

TOLEDO O.

SMEAD & PROSPECT AVES.

WESTERN PLANT

CHICAGO ILL.

COTTAGE GROVE AVE. & 91ST ST.

TIMKEN STEEL

It was not the question alone of assured deliveries of steel stock that influenced the building and operating of the Timken steel mills. In fact the question of deliveries was of secondary importance.

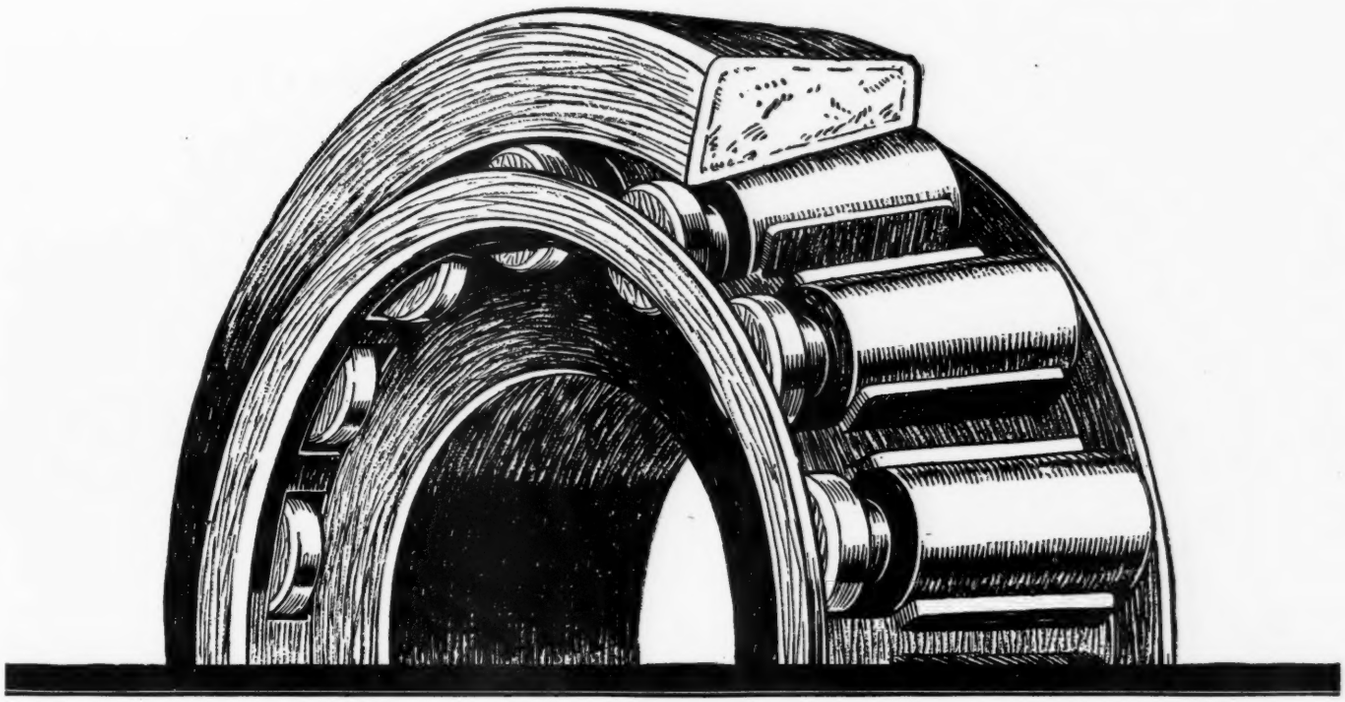
The big consideration involved in Timken's making its own steel was that of quality. Purchasing from different mills made it almost impossible to get uniform quality and specifications. The solution to all these problems was to manufacture our own steel. In that way only could we be sure, not only of deliveries, but of absolute uniformity of material from one year's end to the other.

It is obvious that a bearing

—which is built to carry either radial

T I M

Tapered ROLLER



IN TIMKEN BEARINGS

load, thrust load, and all the resultants of these loads

—which is capable of withstanding these loads and speeds with uniformly negligible loss of power by friction

—which can be taken up or adjusted when the wear that *must* follow all motion does come—

It is obvious that a bearing of this character requires steel that is absolutely uniform in character and specification year in and year out. Only by absolute control of our own steel mills were we assured of this.

The Timken Roller Bearing Company, Canton, O

Timken Tapered Roller Bearings for Passenger Cars, Trucks, Tractors, Trailers, Farm Implements, Machinery, and Industrial Appliances

K E N
Tapered
BEARINGS

The body sells the car when it's a

Raulang

TRADE MARK

Raulang Bodies are now available in these models:

REO COUPE
REO SEDAN
LEXINGTON SEDANETTE
RAUCH & LANG BROUGHAM
RAUCH & LANG COACH
STEVENS DURYEA LIMOUSINE

RAULANG BODY DIVISION
The Baker R & L Co.
CLEVELAND, OHIO. U.S.A.

We have been coach builders for over sixty years

WDF Quality Forgings

DIFFERENT and DEPENDABLE

Designing Engineers as Well as Competent Buying Executives Have Come to Know That

"WDF" Forgings Are Different

That

"WDF" Service Is Dependable

If your problem pertains to Forgings the solution is here

"If it can be forged from steel 'WDF' can forge it"

WESTERN DROP FORGE COMPANY

MARION, INDIANA

Detroit—Brossy Building

WDF Quality Forgings

Philadelphia—Drexel Building

Ship and Sail
in American Ships
For seventy years there has been no American Merchant Marine of sufficient importance to be called such. Before that—back in the days when the clipper ship carried the world's freight—the American skipper was known in every port.
The war came, and with it a need for "ships, money and men." The three were found to fill the need—and the American Merchant Marine came back.
As the steam vessel drove the clipper off the seas, so is the oil-burning American ship once more gaining its old-time place in world commerce.
The ships are there. Good ships, making the ports of all the world, with freight rates and schedules that are on a competitive basis.
"American ships for American goods" is as vital a thought as can be presented to business men. The development of the American Merchant Marine is imperative if America is to progress—and that development is in the hands of American Business to make.
U. S. SHIPPING BOARD
WASHINGTON, D. C.
For sailings of passenger and freight ships to all parts of the world write Division of Operations, Traffic Department, U. S. Shipping Board, Emergency Fleet Corporation, Washington, D. C.
AMERICAN SHIPS FOR AMERICAN GOODS

SERVICE FLOOD OILING FAN

"If It's a Flood Oiling Fan, It's a Service Fan"

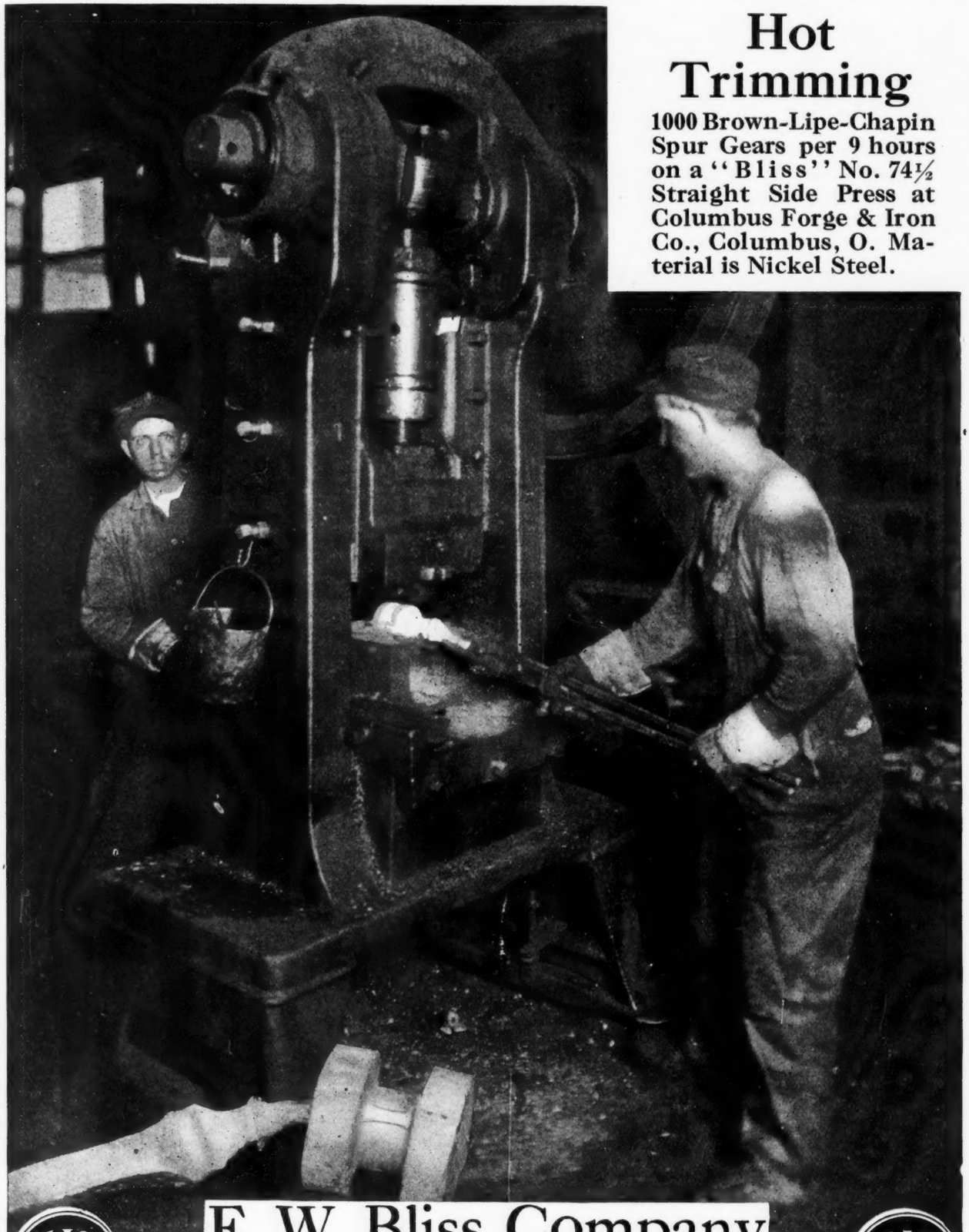
Silence in Operation
Freedom from Mechanical Trouble
Durable, Reliable and Efficient
for
Motor Car, Truck and Tractor

"The Fan that took the Lexington to the top of Pikes Peak"

Put your cooling problems up to us

SERVICE PRODUCTS CORPORATION

INDIANAPOLIS INDIANA



Hot Trimming

1000 Brown-Lipe-Chapin Spur Gears per 9 hours on a "Bliss" No. 74½ Straight Side Press at Columbus Forge & Iron Co., Columbus, O. Material is Nickel Steel.

BLISS

E. W. Bliss Company

BLISS

Main Offices: BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N.Y., HASTINGS, MICH., CLEVELAND, O., SALEM, O.

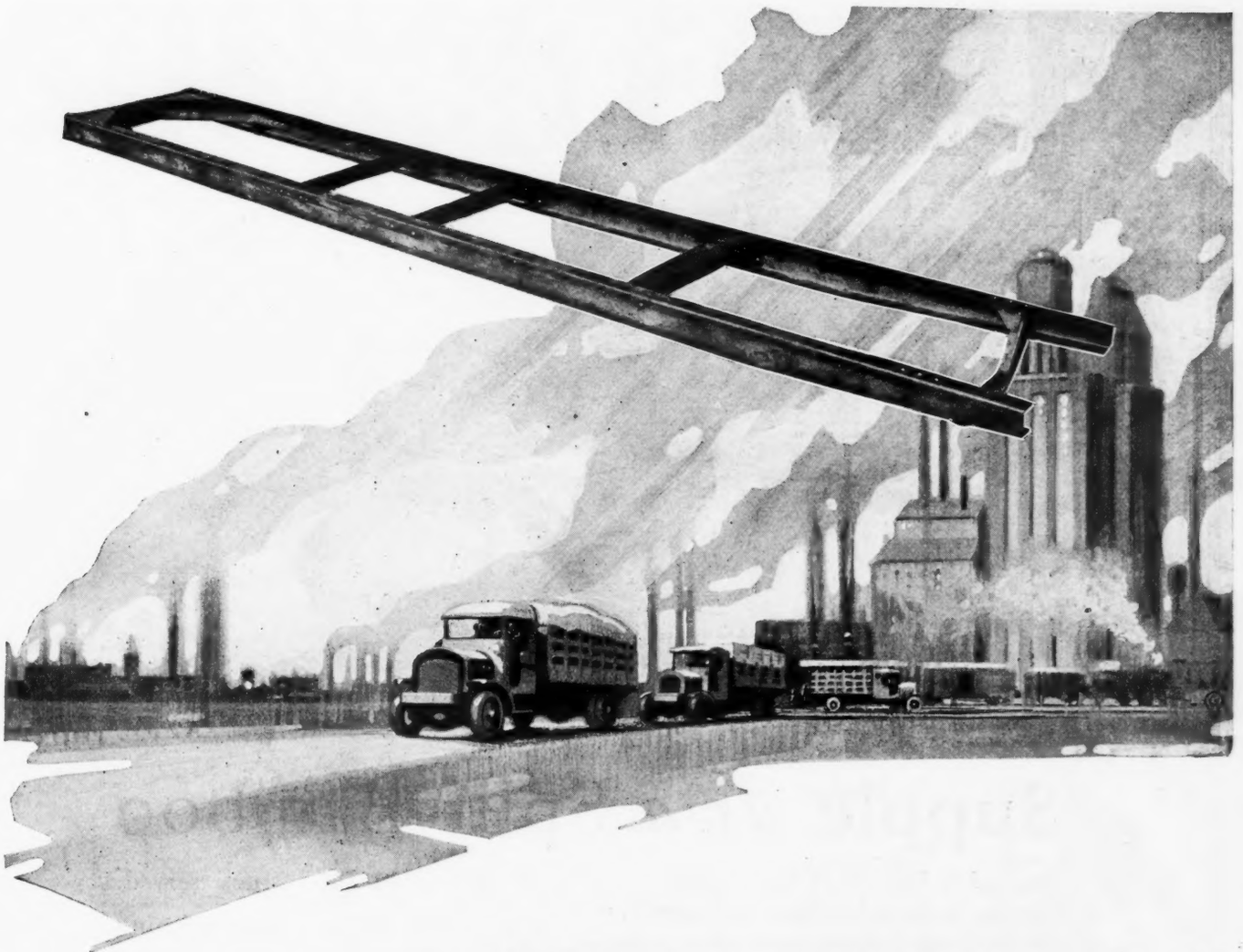
SALES OFFICES

1857 CHICAGO, People's Gas Bldg. DETROIT, Dime Bank Bldg. CLEVELAND, Union Bank Bldg. 1921
CINCINNATI, Union Trust Bldg. BUFFALO, Marine Bank Bldg. ST. LOUIS, Boatmen's Bank Bldg. PITTSBURGH, Keenan Bldg.

FOREIGN SALES OFFICES *and* FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S.E. PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

No. 116



PARISH & BINGHAM
PRESSED STEEL FRAMES

Quality, above all else, has always been the keynote in P & B Frame manufacture. 17 years' successful production for truck and car builders testifies to the wisdom of this policy.

The same standards prevail in the manufacture of the lighter P & B parts, such as Axle Housings, Brake Drums, Step Hangers, Running Boards, etc.

Send your blue prints for estimate.

Frame Makers for Cars of Quality Since 1904

PARISH & BINGHAM CORPORATION
CLEVELAND, OHIO, U. S. A.

PERFECTION
SPRINGS

Supple *as a* Split Bamboo

Staunchly formed of finest steel, Perfection Springs lend an incomparable smoothness to every road they ride.

Theirs is the studied resiliency of springs designed and suspended to conform thoroughly with the individual load and road demands of each motor car and truck served.

Small wonder that an overwhelming majority of automotive manufacturers have standardized on Perfection Springs—the quality product of the oldest and largest maker of automobile springs in the world.

THE PERFECTION SPRING COMPANY, CLEVELAND, OHIO
THE SPRING DIVISION OF THE STANDARD PARTS COMPANY
OTHER DIVISIONS ARE: THE EATON AXLE COMPANY, THE BOCK BEARING COMPANY, THE STANDARD WELDING COMPANY

THESE MANUFACTURERS EQUIP ALL OR PART OF THEIR PRODUCTS WITH PERFECTION SPRINGS

Abbott-Downing Truck & Body Co.
Adams-Barre Company
American Steel & Wire Co.
American Tractor Corp'n
Anderson Motor Co.
Apperson Bros. Auto Co.
Arcadia Trailer Corp'n
Australian Motors Co., Ltd.
Auto Kamp Equipment Co.
Bacon Motors Company
Barley Motor Car Company
Bartholomew Co.
F. H. Berger
Bessemer Motor Truck Co.
C. L. Best Traction Co.
J. T. Boone
Briscoe & Stahl Motor Corporation
Brown City Mfg. Company
Buffalo Truck & Tractor Co.
H. G. Burford & Co., Ltd.
Cadillac Motor Car Co.
Carroll Motor Car Co.
Chandler Motor Car Co.
Chevrolet Motors Co.
Cleveland Tractor Company
Cleveland Trailer Mfg. Co.
Clydesdale Motor Truck Co.
Columbia Motor Truck & Trailer Co.
Commodore Motor Corp'n
Cook Motors Corp'n
Crock Motor Car Company
Crow-Elkhart Motor Corp'n
Curtis Motor Car Company
Daniels Motor Car Co.
Dart Truck & Tractor Co.
Defiance Motor Truck Co.
Dependable Truck & Tractor Co.
Dort Motor Car Co.
Dunham Company
Elkhart Carriage & M. C. Co.
Elwell Parker Elec. Co.
Erie Motor Truck Mfg. Co.
Essex Motors Company
Fergus Motors, Inc.
Ford Motor Company
Fremont Motor Car Co.
Fruehauf Trailer Co.
Fulton Motor Truck Co.
Garford Motor Truck Co.
Gove Motor Company
Gramm-Bernstein Motor Truck Co.
Grant Motor Car Corp'n
Hal Fur Motor Truck Co.
Halladay Motor Corp'n
Hamlin-Holmes Motor Company
Harrisburg Mfg. & Boiler Co.
Harvard Motor Car Co.
Highway Trailer Co.
Hi-Speed Trailer-car Co.
Holmes Automobile Co.
Hudson Motor Car Co.
Huffman Bros.
International Purchasing & Eng. Company
Jackson Motor Corp'n
Jordan Motor Car Company
Kelly-Springfield Motor Truck Co.
Kentucky Wagon Mfg. Co.
Kenworthy Motors Corp'n
Kline Cars Company
Kurtz Motor Car Co.
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Lansing Company
Lewis-Hall Motors Corp'n
Lexington Motor Co.
Maibohm Motor Co.
Marsh Motors Company
Maxwell Motor Company, Inc.
McFarlan Motor Co.
Mercer Motors Co.
Meteor Motor Car Co.
Metz Company
Miami Trailer Co.
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A. J. Miller & Co.
Moller Motor Co.,
Monitor Motor Car Co.
Nelson Motor Truck Co.
New England Truck Co.
Noma Motors Corp'n
Northway Motors Corp'n
Norwalk Motor Car Company
Ohio Motor Vehicle Co.
Olds Motor Works
Owen Magnetic Motor Car Corp'n
Paige-Detroit Motor Car Co.
Pan Motors Company
Paragon Motor Car Company
Parenti Motors Corp'n
H. W. Peabody Co.
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Robertson Cole Company
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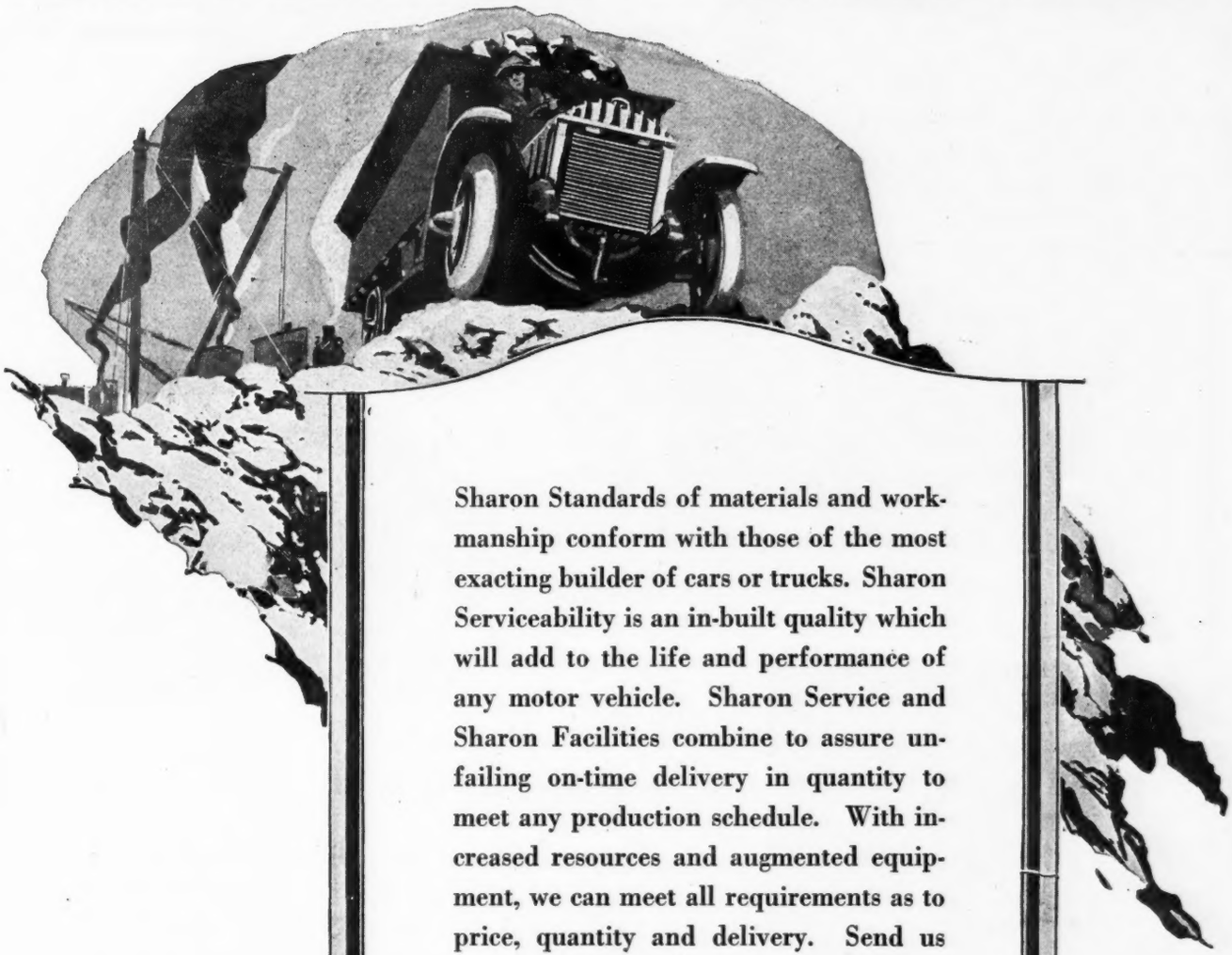
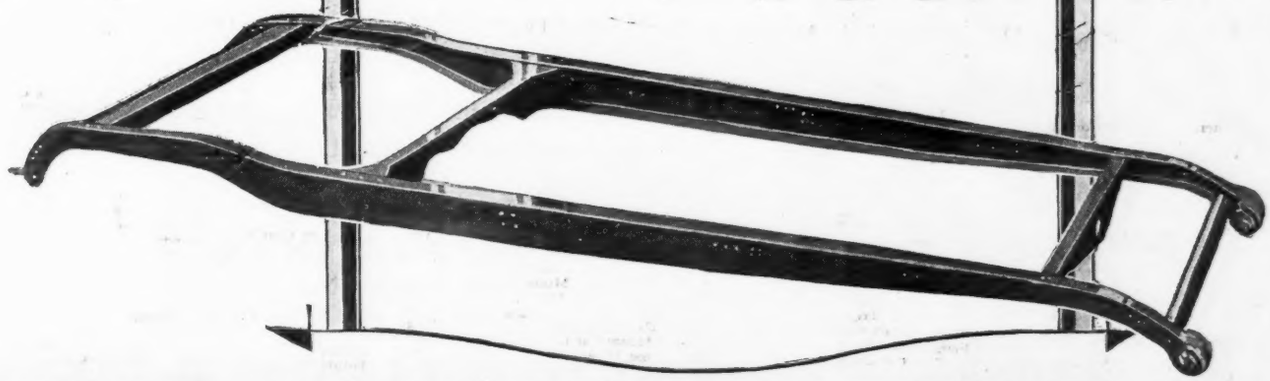
Seagrave Company
Selden Truck Corp'n
Severin Motor Co.
E. M. Sheehan
Signal Motor Truck Co.
Skelton Motors Corp'n
Southern Motor Mfg. Ass'n
Standard Motor Truck Co.
Stanwood Motor Car Co.
F. B. Stearns Co.
Templar Motors Corp'n
Towmotor Co.
Trailmobile Company
Troy Wagon Works Co.
Tulsa Auto Manufacturing Co.
Union Trailer Works
U. S. Tractor & Machinery Co.
Walker Johnson Truck Co.
Walter Motor Truck Co.
White Motor Company
J. C. Wilson Company
Winton Co.

SHARON FRAMES

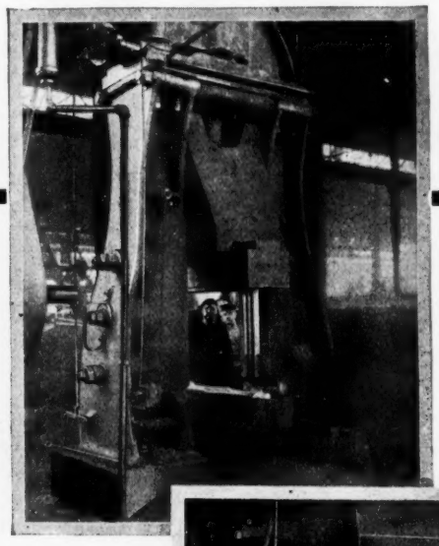


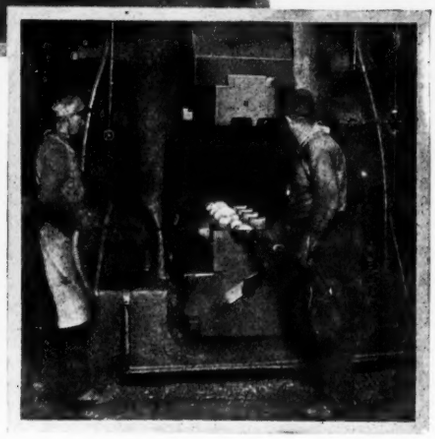
Sharon Standards of materials and workmanship conform with those of the most exacting builder of cars or trucks. Sharon Serviceability is an in-built quality which will add to the life and performance of any motor vehicle. Sharon Service and Sharon Facilities combine to assure unfailing on-time delivery in quantity to meet any production schedule. With increased resources and augmented equipment, we can meet all requirements as to price, quantity and delivery. Send us your specifications. Let our engineers work with yours.

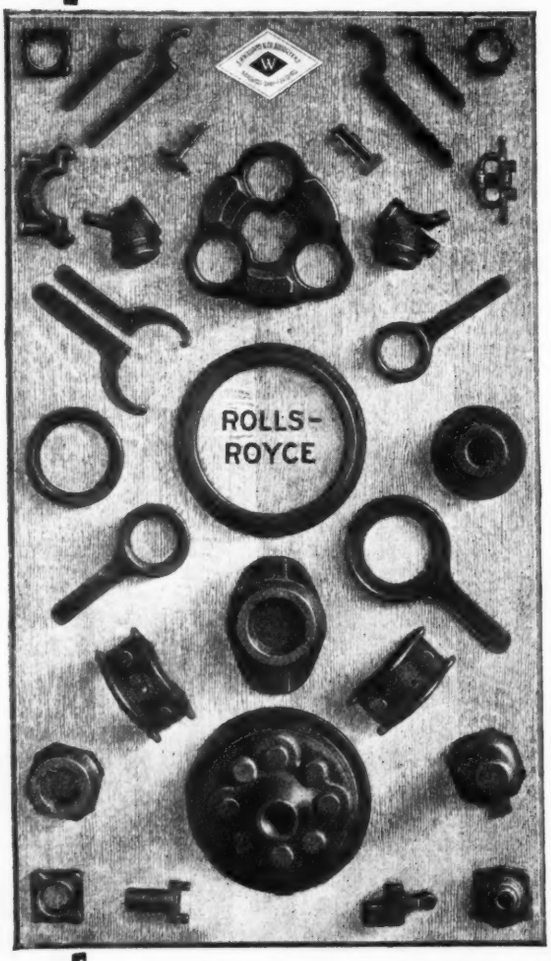


SHARON PRESSED STEEL CO.

MAIN OFFICE AND WORKS, SHARON, PENNA.







Experience

One of the great values of half a century's experience in the manufacture of superior drop-forgings is the knowledge of what to avoid, as well as what to do.

In making Special Drop-Forgings for your particular needs, this experience will insure a product that may be relied upon to fulfill your purchase specifications to the last jot and tittle.

Four complete plants offer unusual advantages for prompt manufacture and quick shipment.

DROP-FORGINGS
often cheaper than castings
—always far superior—

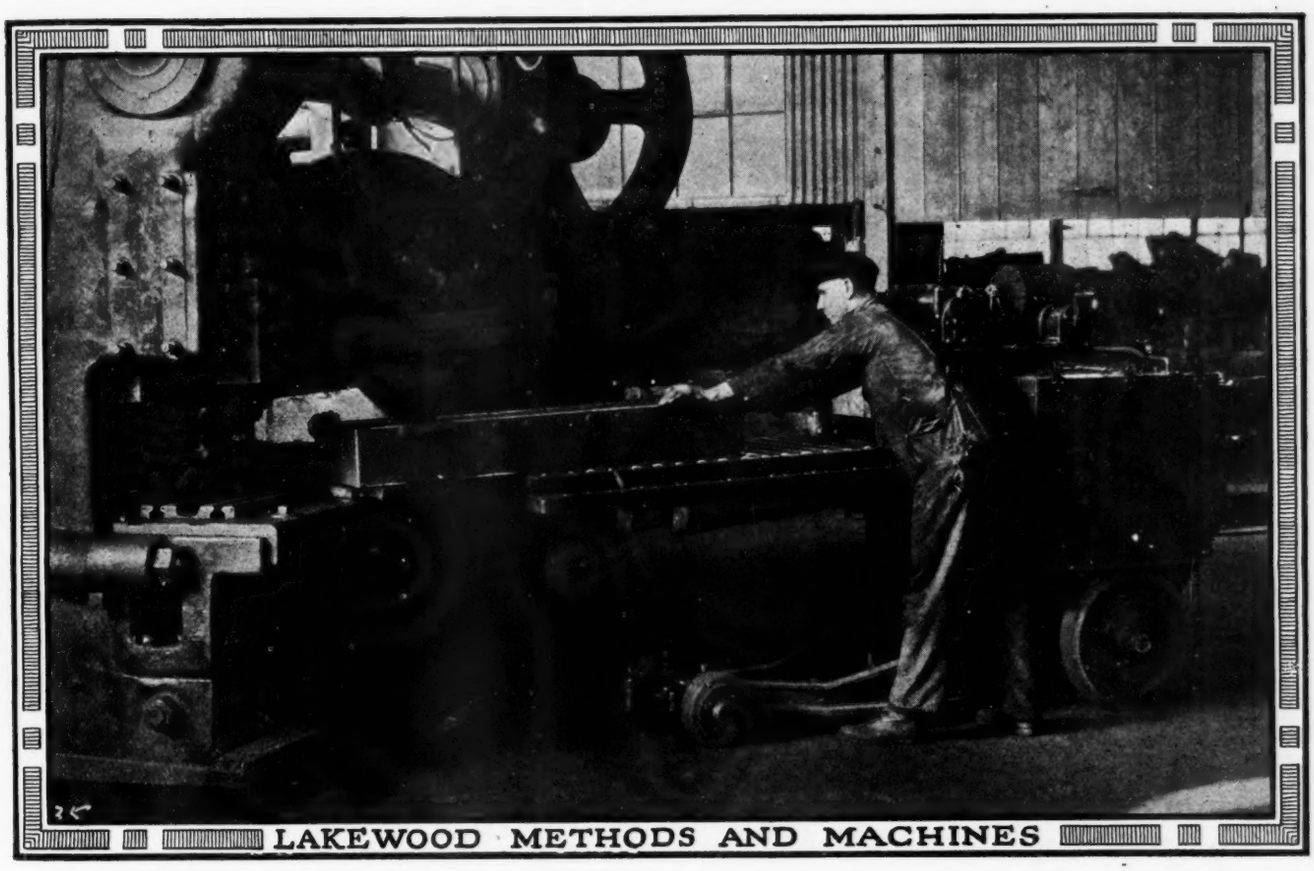
J. H. WILLIAMS & CO.
"The Drop-Forging People"

BROOKLYN
10 Richards St.

BUFFALO
10 Vulcan St.

CHICAGO
1010 W. 120 St.

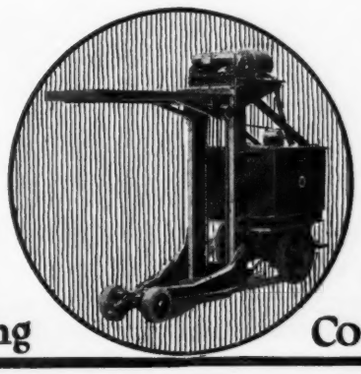
St. Catharines, Ontario



The Tier-Lift with Roller Platform for Handling Heavy Dies

The roller platform, with which the Lakewood Tier-Lift Truck may be equipped, saves $7 to $12 a day in handling heavy dies, and machine work. The heavy loads are moved and lifted to place quickly and easily, with no danger to the workmen. With the roller platform the load slides into place with ease.

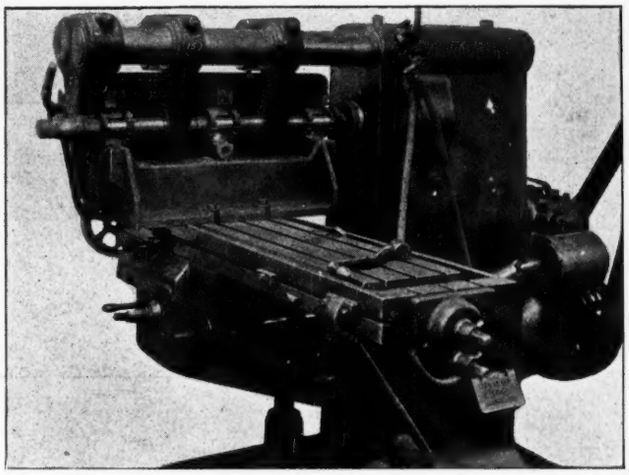
When loading trucks and freight cars with the roller platform, surprising economies can be effected. Let us help figure the possible savings in your plant.



The Lakewood Engineering Company, Cleveland U.S.A.

On Paige Cylinder Blocks

Furnishing further evidence for the justification of the double overarm construction of Milwaukee Milling Machines



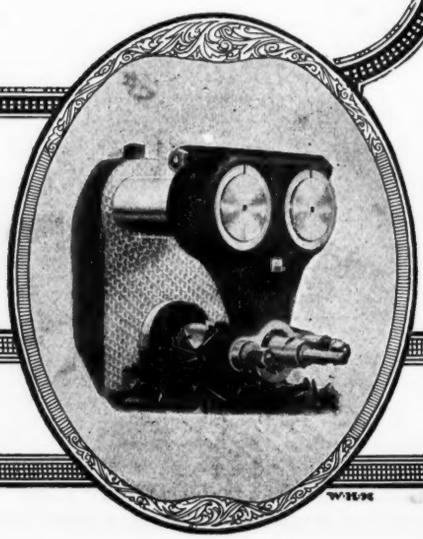
The six cutters here shown on the Milwaukee Horizontal Milling Machine are straddle milling the cheeks of the crank shaft bearings and the oil thrower grooves. Note that in this operation, the length of the block is held sidewise on the table, necessitating the location of the cutters at a considerable distance from the face of the column, affording further and striking proof of the great strength and rigidity gained by the double overarm construction of the Milwaukee Horizontal Milling Machine.

At the plant of the Paige Motor Car Co., in the production of cylinder blocks for the light six model, both the Horizontal and Vertical types of Milwaukee Milling Machines are factors in maintaining a definite production schedule.

If you are not acquainted with the many exclusive features possessed by Milwaukee Milling Machines, you should write for our catalog. Do it now!

Branch Offices in Chicago, Cleveland and New York

KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

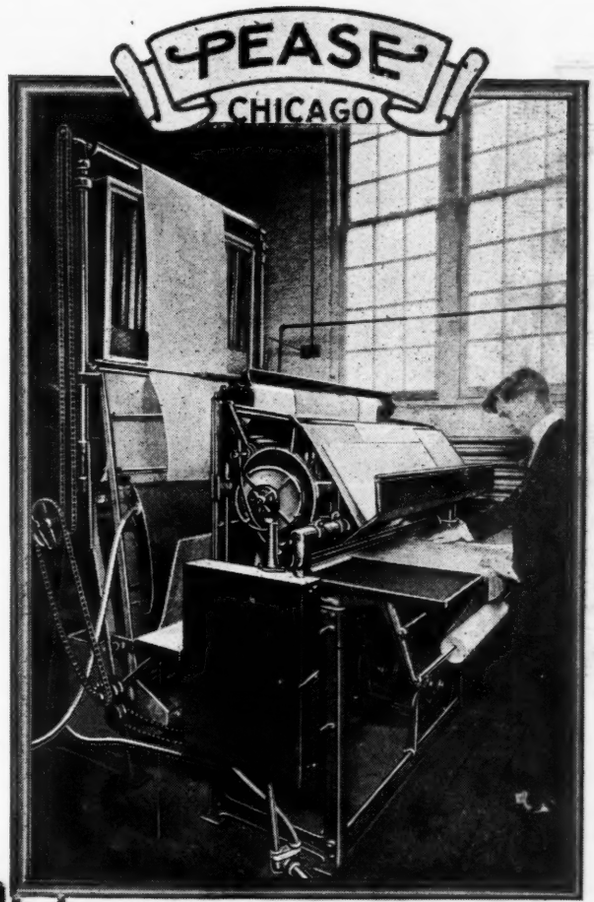


The Double Overarm maintains permanent alignment of the arbor.

Sterling USES A PEASE PEERLESS BLUE PRINTING MACHINE

Crowded into a little six by nine room, at one side of the machine shop and close by the drafting room and assembly floor, this Pease Peerless Automatic and Continuous Blue Printing Equipment makes perfect blue prints at a moment's notice for the Sterling Motor Truck Company of Milwaukee. Production is never retarded for the want of blue prints, because closing a few lamp switches and turning on the water and gas is all that is necessary to put the Pease Peerless in operation to make up to 100 yards of perfect blue prints per hour.

When the demand for prints does not require the entire time of the young operator, he is used for other duties because, with the Pease Peerless, he can print, wash and dry, in one continuous operation, more and better blue prints in one hour than can be done in four hours where independent methods of printing, washing and drying are used. Short runs of five or ten minutes are just as economically handled.



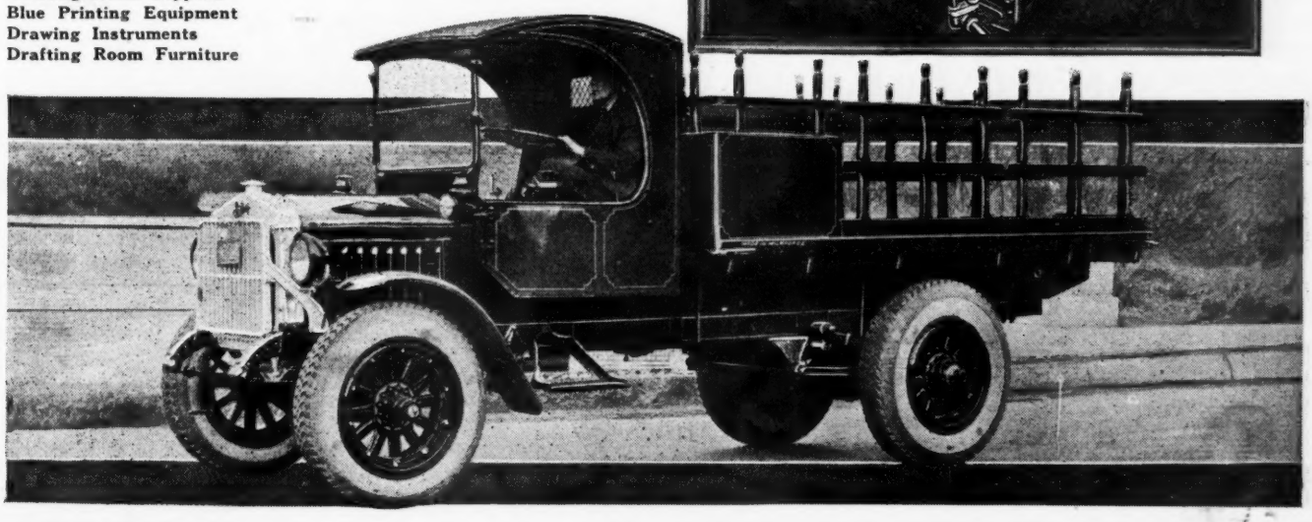
But the Sterling Motor Truck Company is not the only automotive user of the Pease Peerless Blue Printing Equipment; Rolls-Royce of England and of America, Pierce-Arrow, Paige, Stutz and many others each have one equipment; Cadillac, Packard, Hudson, Buick, Studebaker, Maxwell and Dodge each have two; while Ford has six. These prominent automotive plants bought their first and subsequent equipments because the Pease Peerless furnishes blue prints at a lower cost per square foot than is possible by any other method. In any plant using 25 rolls or more of blue prints paper per month, the equipment will pay for itself in a short time. For smaller plants, we have another type of machine—the Pease Vertical, which costs less, does equally good work, but not so rapidly.

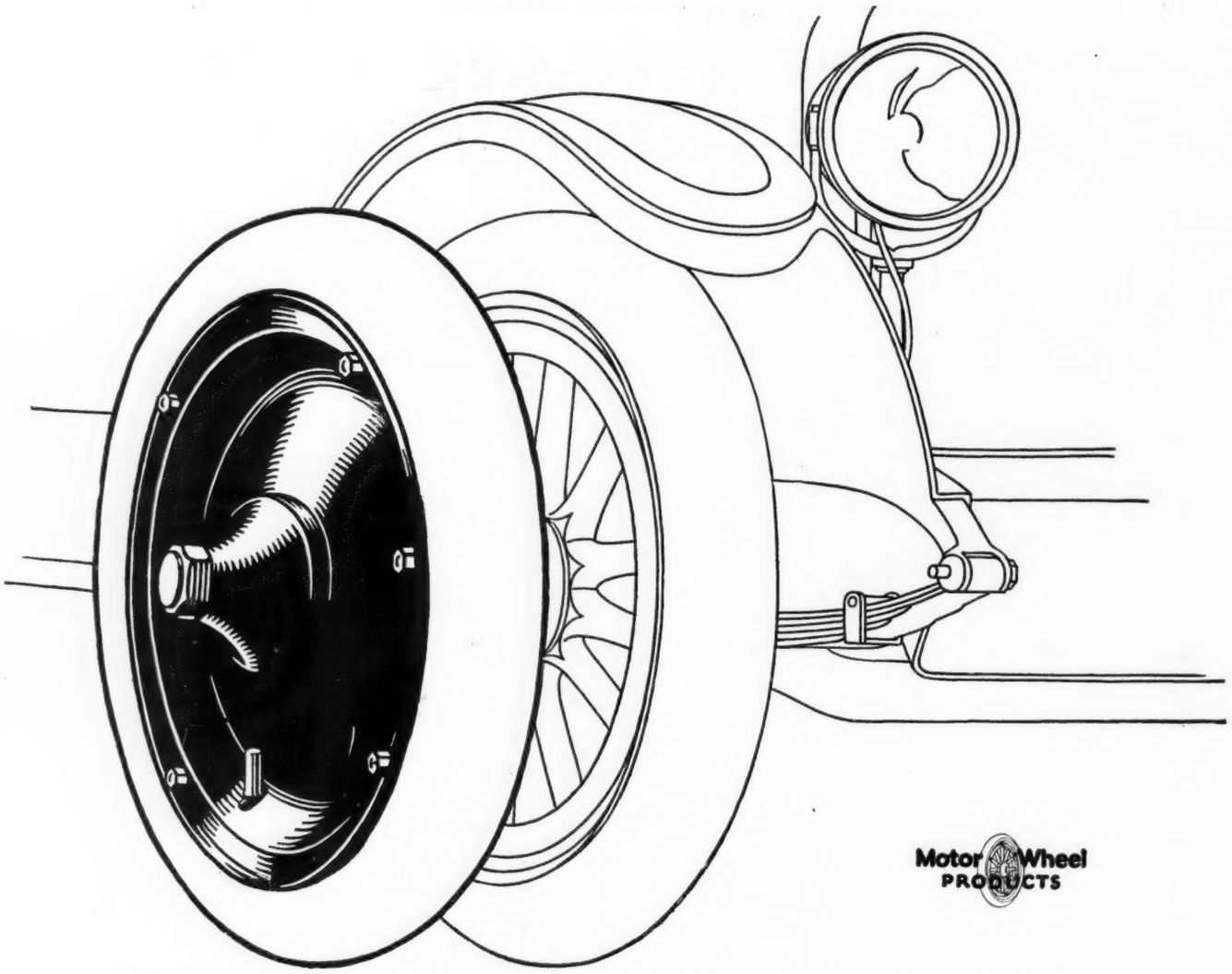
You may have descriptive literature on both—just write.

The C. F. Pease Co.

No. 823 No. Franklin St., Chicago

Drafting Room Supplies
Blue Printing Equipment
Drawing Instruments
Drafting Room Furniture





Identical Mounting Gives Instant Fit

Gier Tuarc Steel Disc Wheels are identical in installation and operation with regulation wood wheels. To change to Gier Tuarc Steel Wheels simply take off the wooden wheels and slide on the Gier Tuarc wheels. Not a single nut or bolt on your car is changed.

And in operation

—you inflate tires from the *outside* of the disc just as you do a tire mounted on a wood wheel

—in changing tires you change the rim—as in wood wheel practice—not the entire wheel.

This is vital, for changing wheels is at best a hard, mussy job—and in larger sizes almost impossible for one person. This disagreeable labor is eliminated in Tuarc wheels, by the use of regulation demountable rims.

The "two-arc" construction not only adds distinguishing beauty to Gier Tuarc Steel Wheels but provides great strength with extreme lightness.

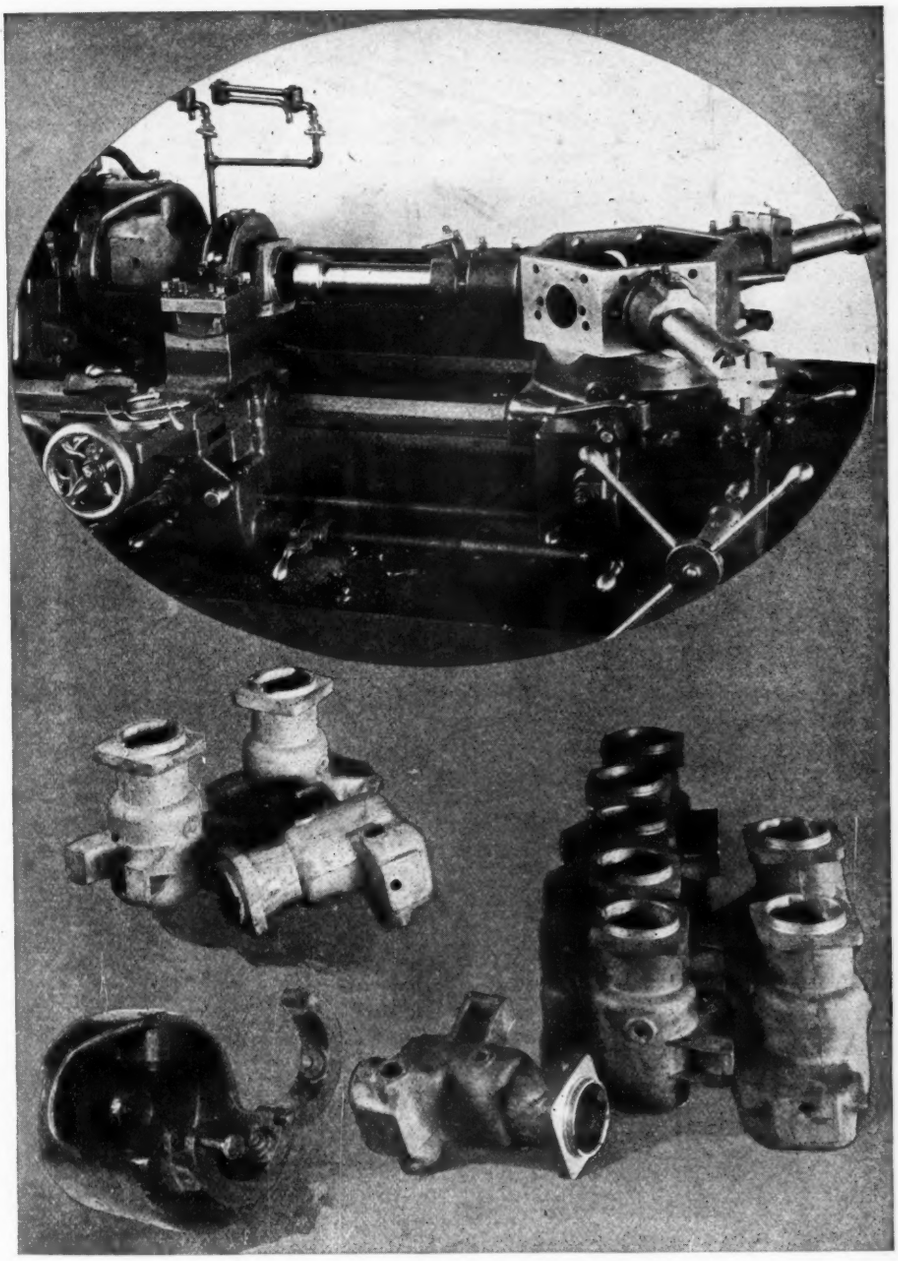
The powerful appeal of these advantages cannot be overestimated. Write us for complete information about the remarkable Gier Tuarc Steel Disc Wheels.

MOTOR WHEEL CORPORATION, Lansing, Michigan

Motor Vehicle Wheels Complete
1310 S. Grand Ave., Los Angeles, Cal.

Metal Stampings—Steel Products
33 W. 42nd St., New York City

Gier
Tuarc
STEEL WHEELS



Gas Engine Builders
finish
gears
cylinders
pistons
fly wheels
pins
studs
shafts
and other Engine
parts on
Warner & Swasey
Turret Lathes with
accuracy and speed.

The picture shows
a No. 3-A
finishing cylinders
in 10 minutes each.

It will pay you to
investigate W. & S.
methods of finishing
engine parts.

The Warner & Swasey Company

Cleveland, U. S. A.

BRANCH SALES OFFICES

NEW YORK: Singer Building BUFFALO: Iroquois Building
CHICAGO: 618-622 Washington Boulevard
DAYTON: 518 Mutual Home Building
BOSTON: Oliver Building DETROIT: 5928 Second Boulevard
MILWAUKEE: 209 Sycamore Buliding
INDIANAPOLIS: 940 Lemcke Annex

DOMESTIC AGENTS:

Fulton Supply Company, Atlanta, Ga.
Young & Vann Supply Company, Birmingham, Ala.
Woodward, Wight & Company, New Orleans, La.
Salt Lake Hardware Company, Salt Lake City, Utah.
Smith-Booth-Usher Company, Los Angeles, Calif.
Fred Ward & Son, San Francisco, Calif.
Portland Machinery Company, Portland, Oregon.
Hallidie Machinery Company, Seattle, Washington.
Hendrie & Bolthoff Mfg. & Supply Company, Denver, Col.
Peden Iron & Steel Company, Houston, Texas.
Northern Machinery Company, Minneapolis, Minn.

CANADIAN AGENTS:

A. R. Williams Machinery Company, Ltd., Toronto, Winnipeg, Vancouver, St. John.
Williams & Wilson, Ltd., Montreal.

FOREIGN AGENTS:

Charles Churchill & Company, Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.

Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.

Wilhelm Sonesson Company, Malmo, Copenhagen, Stockholm, Gothenburg.

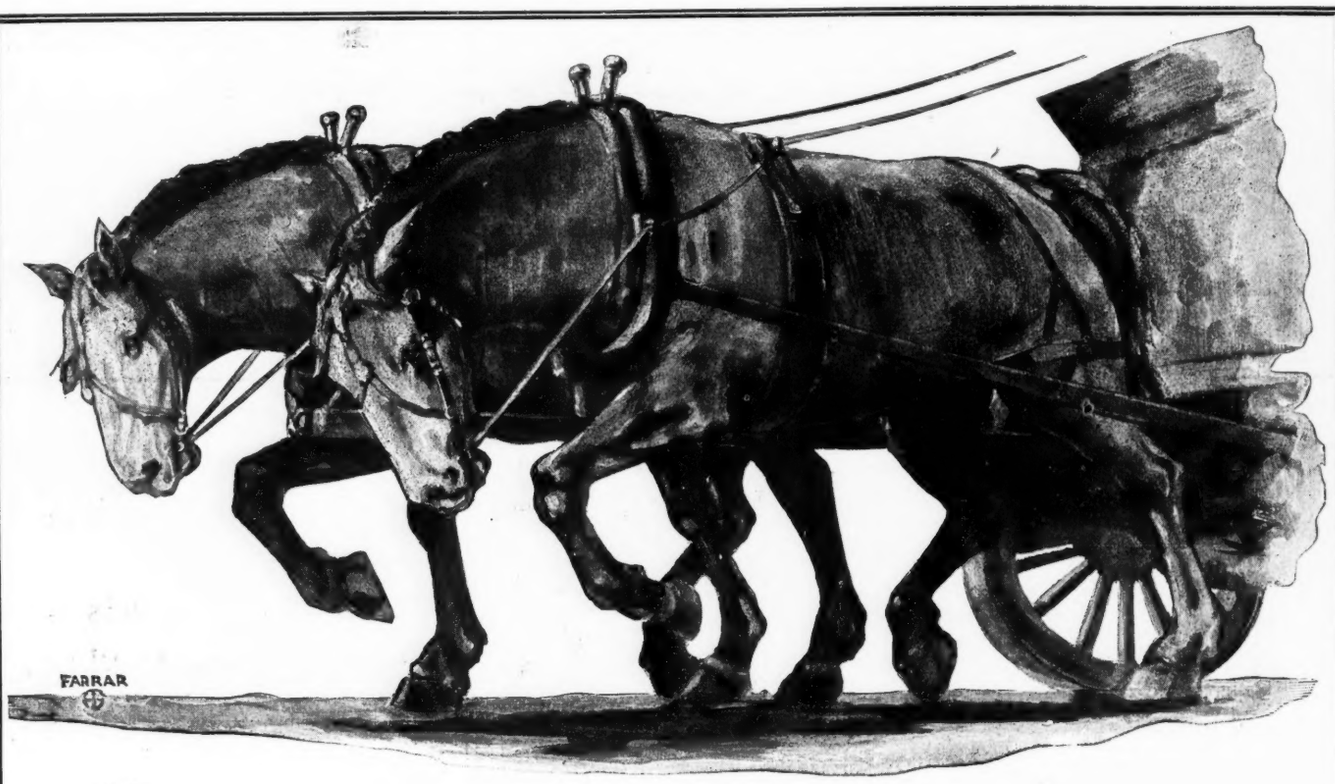
R. S. Stokvis en Zonen, Rotterdam.

Benson Brothers, Sydney, Melbourne, Adelaide.

Yamatake Company, Tokyo, Osaka, Nagoya, Fukuoka, Dairen.

McLeod & Company, Calcutta.

Andersen, Meyer & Company, Ltd., Shanghai.



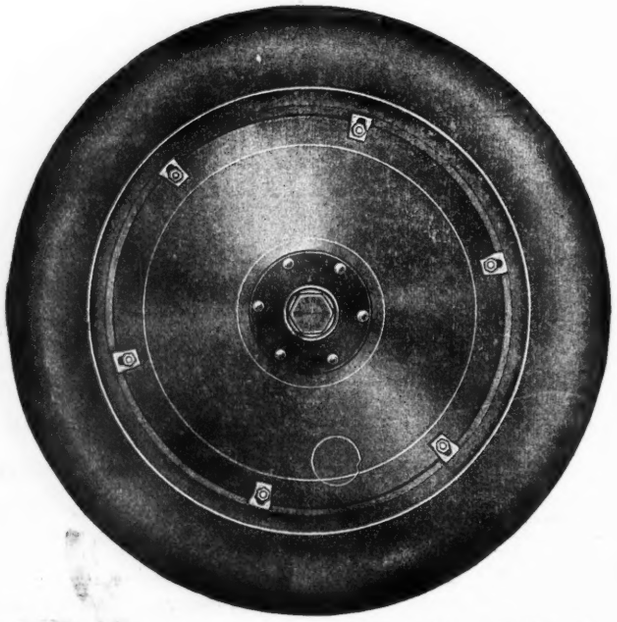
A Horse Is No Stronger Than His Legs

The wheels are to the automobile what feet and legs are to the horse.

By continued tests, laminated wood has proven itself of superior strength in many ways. In aeroplane propellers, struts, braces, heavy furniture, boats—and now in wheels for motor cars.

SMITH WOODISK WHEELS

Reg. U. S. Patent Office



have demonstrated THEIR superiority by tests of heat, steam, side stress and direct load pressure.

In motor cars this woodisk wheel offers the ultra smartness to be had only in disc wheels combined with the LACK of rumbling and noise attached to the steel or iron disc wheel.

Write for booklet and prices.

GEO·W·SMITH·&·CO·INC·
Philadelphia, Pa.

The largest wood-working plant in the east, occupying 23 acres.

Maximum Strength BY EVERY TEST Minimum Weight

THE peculiar properties of Vanadium make it the one master alloy that meets all the severe requirements of the automotive field—

NEARLY three-quarters of a century elapsed after the discovery of Vanadium before its value in metallurgy was appreciated or a sufficient quantity of it was obtainable to be of any aid in the fabricating of steel.

The first authentic record of its use in metallurgy was in the making of armor plate. Today it finds use in practically every industry of the metal working fields.

Its extensive use in the automotive field can be attributed to the peculiar properties that make it the one master alloy that meets all the severe requirements of automotive construction.

The three dominant reasons why there is scarcely a car or truck built today in which Vanadium steel is not used for some vital parts:

First: It gives maximum strength with minimum weight, so necessary in automotive construction.

Second: Combined with this strength is a remarkable degree of toughness that withstands the most gruelling service.

Third: Its anti-fatigue properties give complete protection against the continuous vibrations that test the metal of every car, truck or tractor.

The Story of Vanadium Is Interesting

Write today for your copy of
VANADIUM
(The Master Alloy)
In
War and Peace

The principal source of supply of Vanadium is the deposit at Mina Ragra, Peru, about 28 miles from the Cerro de Pasco Railroad, and about 15,500 feet above sea level, one of the highest operated mines in the world. The mining is done by Indians, the only labor capable of manual work at this high altitude.

Stripping and Mining Vanadium Ore
Mina Ragra Peru

Vanadium Corporation *of* America
120 Broadway New York

VANADIUM

THE MASTER ALLOY

LOOK for the Sign of the Orange Disc.

THE motorist at home or on his tour welcomes *The Sign of the Orange Disc* for what it represents—quality products.

The dealer who displays this sign conscientiously serves regular patrons knowing full well the repeat-order value of "GULF" products.

SUPREME AUTO OIL *leaves less carbon*—lubricates efficiently. "GULF" dealers are cashing profits on these well known facts.

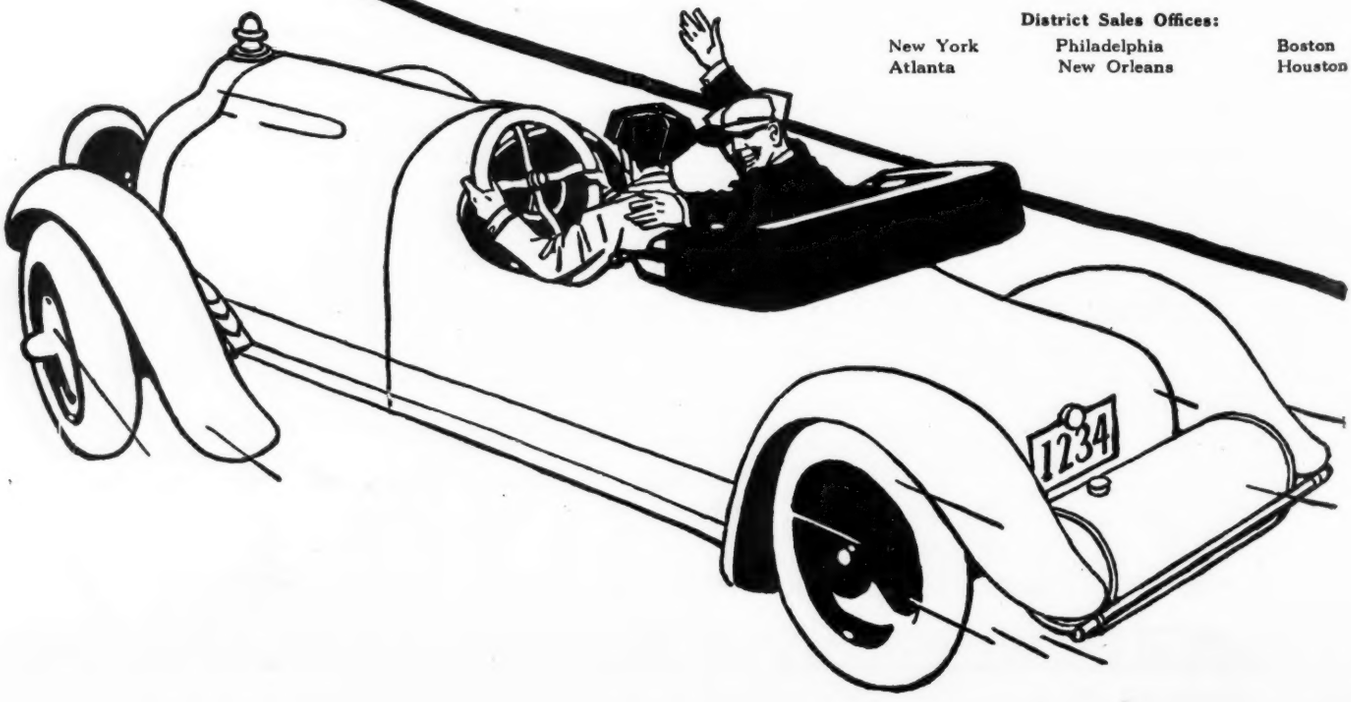
If you are not a "GULF" dealer, our salesman in your territory will show you the way.

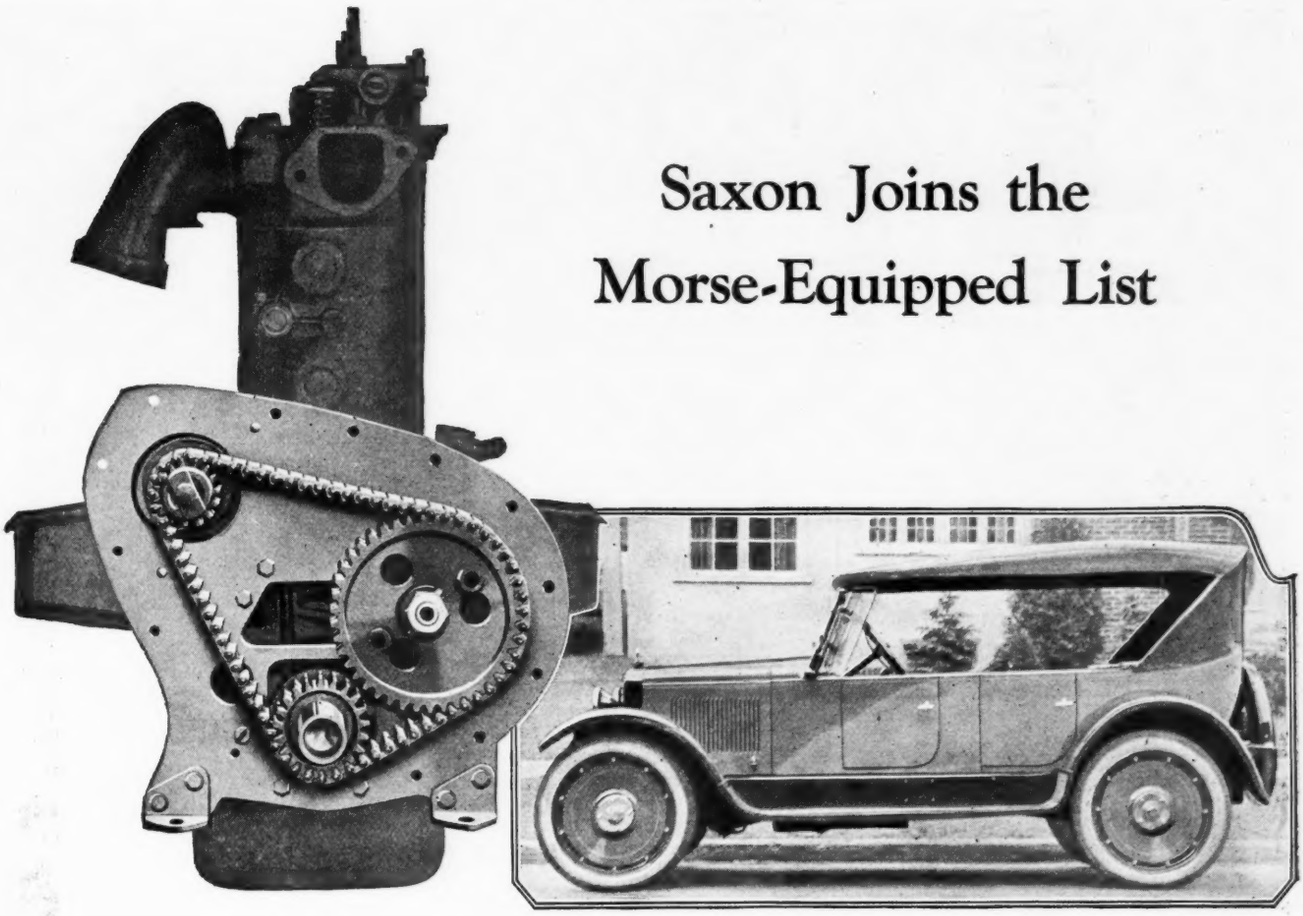
GULF REFINING COMPANY

General Sales Offices: PITTSBURGH, PA.

District Sales Offices:

New York	Philadelphia	Boston
Atlanta	New Orleans	Houston





Saxon Joins the Morse-Equipped List

IN adopting the Morse Front End Drive as standard equipment, Saxon engineers were guided by facts, and by its actual performance in trials. They were impressed by the same merits in it as have led to its adoption by the makers of leading cars in every grade.

The genuine Morse Front End Drive will impress you as it impressed Saxon engineers. Investigate it today.

MORSE CHAIN COMPANY

Main Office and Works
ITHACA, NEW YORK

Sales and Engineering Office
DETROIT, MICHIGAN

MORSE

GENUINE SILENT CHAINS

New Departure Ball Bearings

NEW DEPARTURE BALL BEARINGS AND THEIR UNIVERSAL APPLICATION

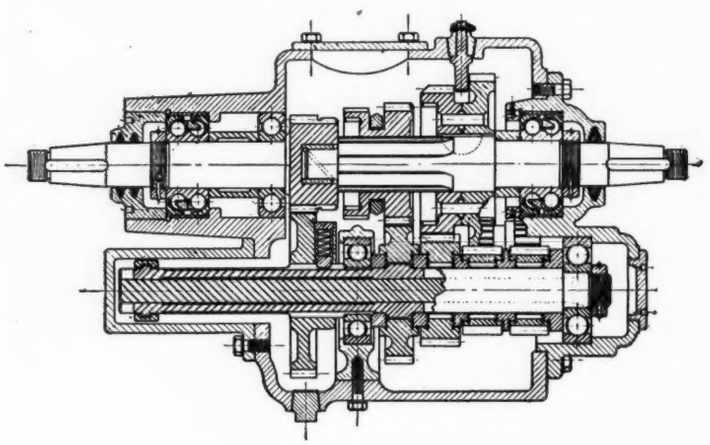
ENGINEERING INFORMATION

Issued at frequent intervals to show practical mountings of New Departure Ball Bearings for securing correct installation, operating efficiency and economical service.

Published by Engineering Department

PLEASE FILE — BINDER ON REQUEST

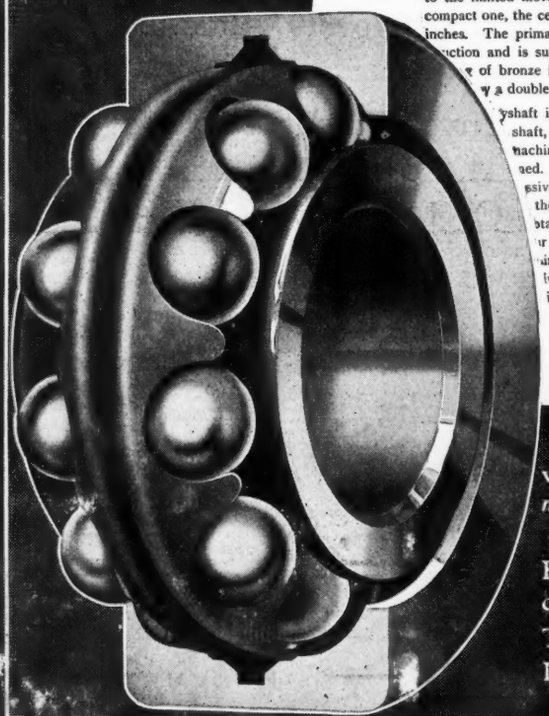
New Departure Mfg. Co. Bristol, Conn. — No. 119.



A Novel All-in-Mesh Gearset.

The change speed gearing outlined above is a distinctive design in which the gears are constantly in mesh, the gears on the countershaft being locked to that member by a sliding-rolling key moving in its interior. All speeds except the high speed or direct drive are obtained by means of this key which is moved along to clutch the desired gear to the layshaft and thus to secure the action of the necessary reduction gears. Owing to the limited movement of the one shift member on the main shaft, the gearbox design is an exceptionally compact one, the center distance between bearings on the layshaft in the two-three ton size being but six inches. The primary shaft that carries the constant mesh or layshaft drive gear follows conventional con-uction and is supported by a combination single and double row bearing mounting. The usual spigot of bronze is used to support the telescoping end of the main shaft and this shaft is positively a double row bearing at the other end with clamped inner and outer races.

yshaft is supported by single row bearings, having the inner races clamped against suitable abut-shaft, the outer races being held from more than a few thousandths of an inch lateral movement achined in the housings. When the gears and sliding key are in the position shown, the third ged. As the key is shifted toward the drive end, the second, low and reverse speeds are ssively. The gears on the countershaft are mounted on collars or rings which act as bearing they carry only the weight of the gears, there is but little wear. The power transmitting btained by sliding the key shifting member along the longitudinal grooves in the shaft until r the ring of the desired layshaft supported gear and then roll into engagement with one of ings made to receive them in the gear interior. As soon as the normally free gear is kept ve to the shaft, the drive is just as in the gearbox of conventional design when the reduc-into mesh.



"Interesting and instructive. We have obtained many valuable ideas regarding bearing mountings from it"—*mechanical engineer of leading western manufacturer.*

These Engineering Data Bulletins are issued monthly. Binder and over 100 bulletins may be had now, by requesting them on your letterhead, giving official position.

THE NEW DEPARTURE MANUFACTURING CO.

Detroit BRISTOL, CONN. Chicago

Coaster patent licenses

Westinghouse

When Should Service Begin?

Service that deserves the name must be an integral part of the policies of a Business, so that it functions side by side with all other activities.

The so-called Service that is forced by outside demands, or is hurriedly developed to meet competitive conditions, never really fills the need nor solves the problem.

Westinghouse Service to the automotive field began on the same day the Automotive Department received its first order for equipment. On that day the Service Department was organized and put to work in recognition of the responsibility created by the acceptance of the order.

From that little establishment has grown a big and capable department, serving both the Automotive Industry and the Automotive Public. Two hundred and forty stations, carefully located, care for all users of Westinghouse Equipment whatever they may need, wherever they may be.

Westinghouse Service begins even before business relationships commence, and will last as long as there is a single customer who may need it.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
Automotive Equipment Department
General Sales and Service Offices, 82 Worthington St., Springfield, Mass.

STARTING - LIGHTING - IGNITION

W
WESTINGHOUSE ELECTRIC

Service

The War Department is releasing surplus aeronautical equipment of more than three million dollars value at prices almost unbelievably low. This surplus includes material of every description, much of it new and a great deal in exceptionally good condition. In this sale will be found items of the greatest interest to the aviation industry.

Engines

5742 Aeronautical Engines of the following makes: Anzani, Benz, Bugatti, BR-2, Clerget, Fiat, Gnome, Hall-Scott (the famous A-7A type), Hispano-Suiza, Lawrence, L-Aviateur, Le-Rhone, Liberty (both 8 and 12 cylinder types), Maybach, Mercedes, Oberursel Frankfort, Opel, Peugeot, Renault, Sturtevant, Thomas-Morse, Wright, Salmson.

Prices on new engines, except Liberty "Twelves," range from $100 to $600.

Engines in fair condition at lower figures. *INVESTIGATE.*

Planes

A total of 111 planes are offered in this sale. The following makes are represented: Glenn Martin, Halberstadt Biplane, Nieuport, L. V.G., Pfalz, Pomillion, Roland, Rumpler, Standard, Sturtevant, Sopwith. While many are unserviceable and fit only for experimental and instruction purposes, some are complete with engines and can be made serviceable by overhauling.

Prices range as follows for single planes: $100, $150, $200, $250 and up to $1000.

Catalog gives complete descriptions, prices, etc.

Spare Engine Parts and Accessories

A considerable quantity of spare engine parts for the engines and planes included in this sale are also offered, including such representative items as: Bushings and fittings, base plates, oil and water pump parts; magneto parts, pistons, shafts, crank and cam; valves and valve stems; springs; piping, and in fact, every part of the engine.

Tachometers: Hall-Scott, Warner type. About 144 are offered.

Wheels, ball races and collars, radiators, generators, fuel tanks; tires and tubes.

To the Speed Boat Enthusiast

Many of these engines have been converted by purchasers for use as regular marine egines for speed boats, or mounted on boats and used as air drive. Catalog gives complete details, including manner and cost of converting these power plants to such uses.

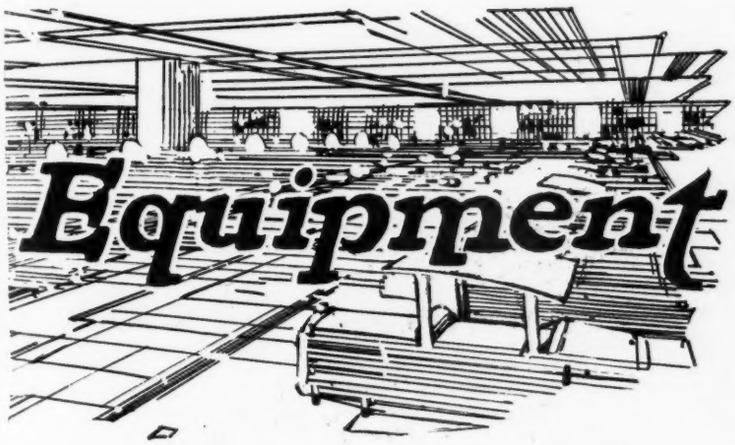
Send for Descriptive Catalog

Complete, detailed description of all material offered, together with prices and terms of sale, are given in an illustrated catalog which will be sent to any person on request. Write for your copy to-day.

Sale of

UNITED ST

SURPLUS AERONA



More Than a Quarter Million
SPARK PLUGS

Plugs of every description, most of them new, ranging in price from five cents to thirty cents, with a few at seventy cents. The list of plugs includes such well-known names as: Splitdorf, Champion, Mosler, Bethlehem, Joly, Rajah Pash, and a number of makes such as: Eyquem, Paris; Frigo, Brevit; Leda; Pognon Reparation; K. I. G. F. No. 9.

Just an instance of the great values offered will be found in the range of prices on the aeronautical engines—a new engine as low as $100.00. Practically every type of engine is included, with a total of twenty-four different foreign and domestic makes being represented. Planes, some complete with engines; Sea Sleds and Hangars constitute the remainder of the material offered. Every item is of compelling interest. Note the catalog offer.

The War Department earnestly advises prompt action on the part of prospective buyers as all material is offered subject to prior sale and all sales are by negotiation at a fixed price. Full inspection privileges are allowed; in fact, it is the desire of War Department that all prospective purchasers shall inspect the material carefully. See catalog for locations and complete information.

U.S. AIR SERVICE

Sale at Fixed Prices

All the material in this sale is offered at fixed prices which are plainly stated in the descriptive catalog furnished to all interested persons. The terms of sale are in no way involved and shipments will be made promptly. The terms of sale and everything the prospective purchaser might wish to know concerning the material is covered in the catalog.

Special Prices in Quantity

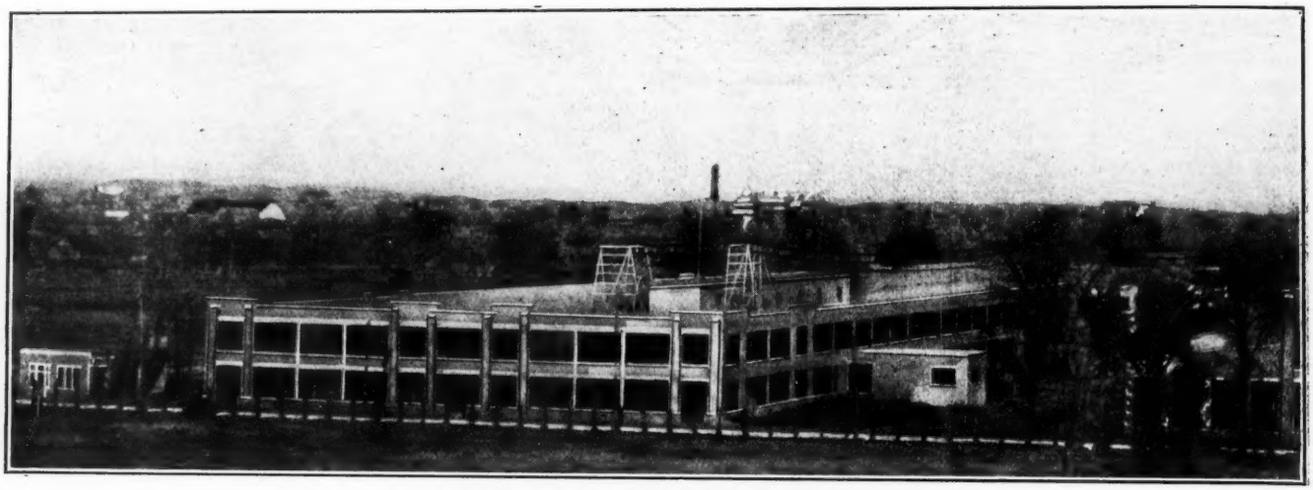
On the engines offered a special price will be given on quantities and where the purchaser buys the entire lot of a certain make of engine, all the spare parts for that engine will be included in the purchase at no extra cost.
All orders, requests for catalogs or information should be addressed to

MATERIAL DISPOSAL
and
SALVAGE DIVISION

AIR SERVICE
WAR DEPARTMENT

1616G Munitions Bldg.
WASHINGTON, D. C.

TES ARMY
S
UTICAL EQUIPMENT



PETER LYALL CONSTRUCTION CO. PLANT

Two Canadian Plants Ready for Occupancy

The United States is offering either or both for sale by sealed bids closing at 3 P. M. (Standard Time)

July 25, 1921

THESE two new manufacturing establishments, of the best modern construction, located in a rapidly growing industrial section of Montreal, P. A., Canada, and **admirably adapted to the needs of any progressive manufacturing concern,** are offered for sale by the Quartermaster General, United States Army. The government will accept bids for either one or both of these plants. They are located in the environs of Montreal, along the St. Lawrence River.

PETER LYALL CONSTRUCTION CO. PLANT

LOCATION:
On the St. Lawrence River, on Notre Dame Street at Longue Pointe, three miles from the center of Montreal.

ACREAGE:
490,935 square feet.

FACILITIES:
Railroad siding connecting with the Canadian Pacific, Canadian Northern and Grand Trunk Railroads. Double-track street car line direct to and beyond the plant. Harbor facilities with 25-foot depth of channel for ocean going steamers.

BUILDINGS:
Four buildings of steel, brick and concrete construction, built in May, 1918.

Main Building (two-story)	184,448 sq. ft.
Forge Building	42,328 sq. ft.
Electric and Power Building	20,400 sq. ft.
Heat Treating Building	13,175 sq. ft
Total Floor Area	260,351 sq. ft.

FLOOR LOAD CAPACITY:

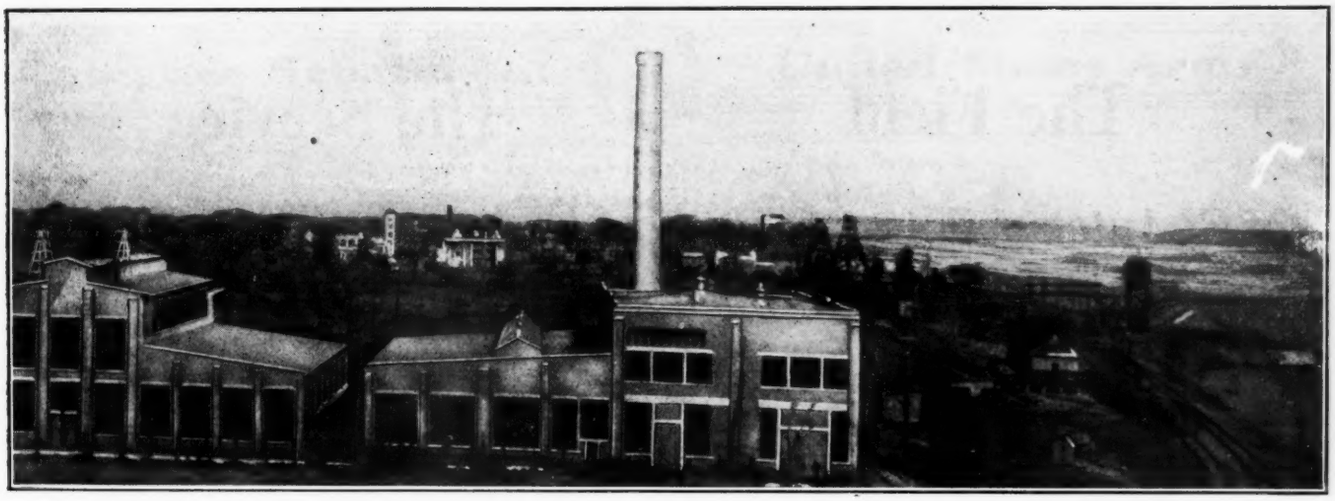
Ground Foor	400 pounds per sq. ft.
First Floor	350 pounds per sq. ft.

Full particulars, specifications of sale, and proposal blanks

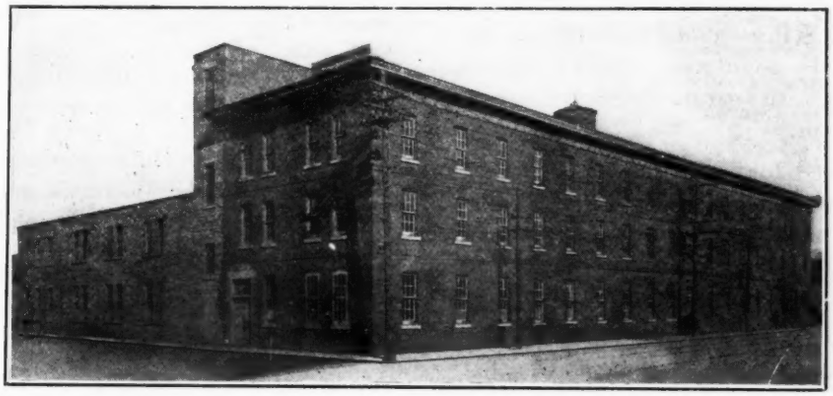
THE QUARTERM

United St

MUNITIONS BUILDING,



These Montreal Properties Have Every Manufacturing Facility:—
Railroads, Water Front, Power and Street Car Service.
Modern Steel and Concrete and Brick Construction.



MUNITIONS AND MACHINERY, LTD., PLANT

LOCATION:
On Seventeenth and Eighteenth Avenues and Notre Dame Street, at Lachine, Montreal, seven miles from the center of the city.

FACILITIES:
Railroad siding connecting with the Canadian Pacific, and Grand Trunk Railroads. Double-track street car line direct to and beyond the plant.

BUILDINGS:
One three-story main building of brick, with one and two-story additions and a small wooden building used for oil storage.

Main Building and Additions	42,000 sq. ft.
Oil Storage	3,000 sq. ft.
Total Floor Area	45,000 sq. ft.

FLOOR LOAD CAPACITY:

Ground Floor	300 pounds per sq. ft.
First and Second Floors	250 pounds per sq. ft.

may be obtained upon application to address below

ASTER GENERAL
ates Army
WASHINGTON, D. C.

The Field

of El Automovil Americano for Automotive Trade

In 1920, $106,415,000 worth of automotive products were sold by American manufacturers to the 26 Spanish and Portuguese speaking countries.

This amount represents 28% of the total automotive exports to all parts of the world, and includes cars, trucks, motorcycles, tires, accessories, etc.

Last year these 26 countries proved themselves profitable markets. In future years they are going to become more so.

They offer a land area approximately three times that of the United States—about 9,000,000 square miles. The total population—123,000,000—is greater than ours. In natural resources their wealth is tremendous.

These resources need for development far better transportation—more man power. Motor apparatus is furnishing and will furnish both—the field for sales of automotive equipment will continue to expand.

Sales will expand as the automotive dealers in the 26 Spanish and Portuguese speaking countries become better acquainted with American equipment and what it can do—where it can be used to advantage.

The publication through which they learn these things—the dealers' business paper is

The Service

of El Automovil Americano to Its Advertisers

Reaching the trade every month is the fundamental service of our publication—reaching it with effective copy and articles on how to sell and maintain American automotive products.

But in addition we offer our advertisers the free translation of correspondence in Spanish and Portuguese. We do this to assure them of correctness. The names and addresses of dealers writing in for information on American products is furnished advertisers so that they may solicit business by mail.

Direct promotional literature may be mailed through this office to our reader list.

Problems of exporting—problems of marketing, shipping, etc., are welcomed and helpful advice given them.

Assistance in the preparation of booklets and circulars into Spanish and Portuguese is available for all advertisers.

Our most recent service is the issuing of monthly "Bulletins" entitled "Export Facts." They contain data and useful information obtained by our Research Department.

Write for a copy of these bulletins.

El Automóvil Americano

Automóviles · Camiones · Moto-Cicletas · Aeroplanos · Tractores

Published in Spanish by

THE CLASS JOURNAL COMPANY

U. P. C. Bldg., 239 West 39th St.
New York City

Publishers of
Automotive Industries—Motor Age—Motor World

Ordnance Department United States Army

Philadelphia District Salvage Board now represents all districts in the East

Items of Compelling Interest From Bulletin No. 63

(Write, Wire or Phone for complete bulletin)

Steel

17890 lbs. of Hot Rolled, Grade "C" steel, size ⅛" x ⅛".
Located at Alleghany Forge Co., McDonald, Pa.

25% Nicket—High Chrome
213 Pieces, 2½" round, 2555 lbs.
287 Pieces, 2½" round, 23,010 lbs.
252 Pieces, 2½" round, 4416 lbs.
Located at Colonial Steel Co., Pittsburgh, Pa.

Malleable Iron

Five tons of Lifting Plug Castings; 3573 plugs in all.

Located at Middletown Ordnance Reserve Depot, Middletown, Pa.

Lead Covered Cable

25,000 ft., 2 million C. M. 1200 ft. 4/0 —2 conductor, 2400 volt. To be sold "as is," "where is."

Location—Midvale Gun Plant, Nivetown, Pa.

Condensers

Three jet condensers, size 24 in. (bulky), capable of handling 10,000 lbs. of exhaust steam per hour, and 1200 to 1500 gallons of water per hour at 70° temperature; 22 in. vacuum. Sold in present condition, present location.

Location — Morgan General Ordnance Depot, South Amboy, N. J.

Transformers

One Westinghouse transformer, No. 10, style No. 10974, 6-140 cycle. Sold in present condition, present location.

Location — Morgan General Ordnance Depot, South Amboy, N. J.

Electric Switches

Twenty-six switches, disconnecting, 300 amp., 7500 volts, on slate panels. Sold in present condition, present location.

Location — Morgan General Ordnance Depot, South Amboy, N. J.

Tools

5 Adjusting Studs; 14 Sets of Dies; 24 Taps; 1 Bourrelet Expander; 16 Reamers; 1 Internal Grinder; 90 Steel Balls; 297 Sets of Chasers; 2 Reamers; 449 Small Glue Chip Tools; 295 Blue Clip Waving Tools; 43 Rex AA Tools 24 Nose Rings 10 Holders and Bolts.
To be sold as one lot.
Location, Neville Island Storage Depot, Neville Island, Pa.

Lathe Equipment

21 Bausche Ball Joints.
13 Studs, 12½" long.
5 Air Valves.
4 Hamifin Air Cylinders.
To be sold as one lot.
Location, Neville Island Storage Depot, Neville Island, Pa.

All communications, requests for further information or bulletin No. 62, listing many additional items should be addressed to the undersigned

Philadelphia District

Ordnance Salvage Board **1710 Market St., Philadelphia, Pa.**
Phone Locust 5120

WAR DEPARTMENT

Part of the sale— not an "extra"

If you're selling low haulage cost—not merely trucks—a Hub Odometer is part of the sale

A vital part to the truck manufacturer, because it enables the **user** of his truck to effect every economy in operating-cost which engineering skill has made possible.

Veeder
HUB ODOMETERS

indicate mileage with the accuracy a truck maker must demand, to register the good performance and protect the good name of his product.

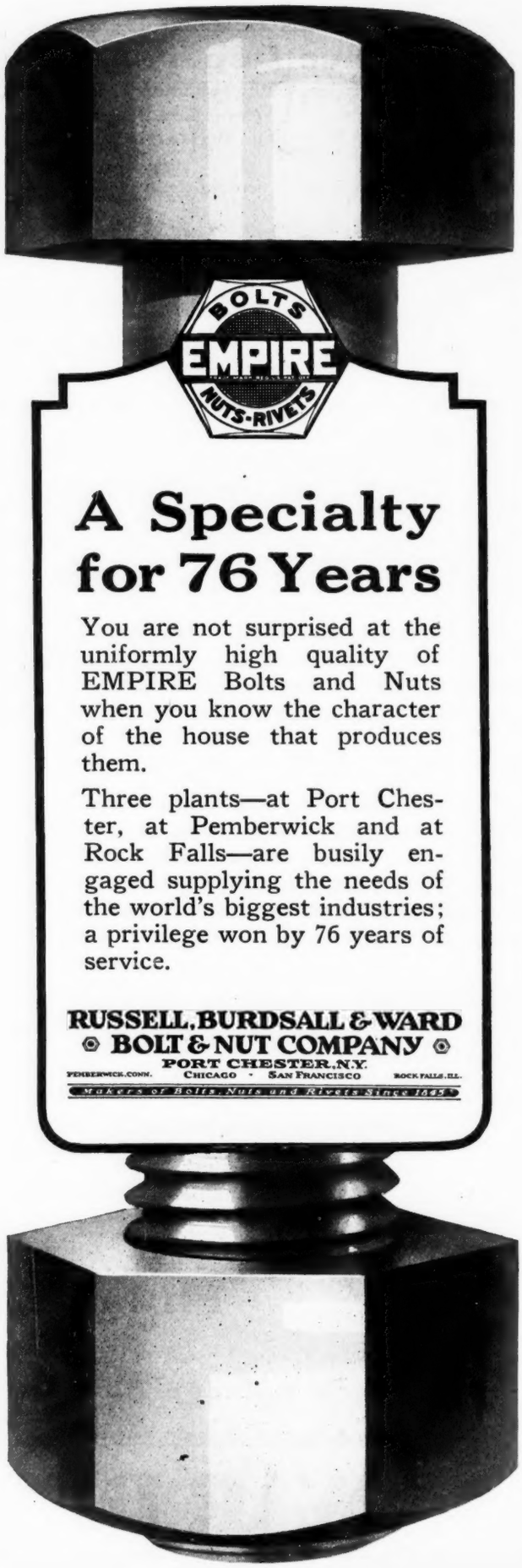
For no other reason do the makers of good trucks tie to the *Veeder* as standard equipment.

The Veeder always adds mileage, whether truck runs forward or backward—totals cannot be falsified. Regular model, adaptable to all standard trucks, $20. Special model for FORD Trucks, $15. Write for descriptive folder and list of equippers.

The Veeder Mfg. Co.
29 Sargeant St. Hartford, Conn.

Sales and Service Stations in

Baltimore, Md.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Cleveland Ohio
Cincinnati, Ohio
Denver, Colo.
Detroit, Mich.
Kansas City, Mo.
New York City, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Rochester, N. Y.
Los Angeles, Cal.
Washington, D. C.
Winnipeg, Man., Can.
San Francisco, Cal.
St. Louis, Mo.
Syracuse, N. Y.
—and other cities.

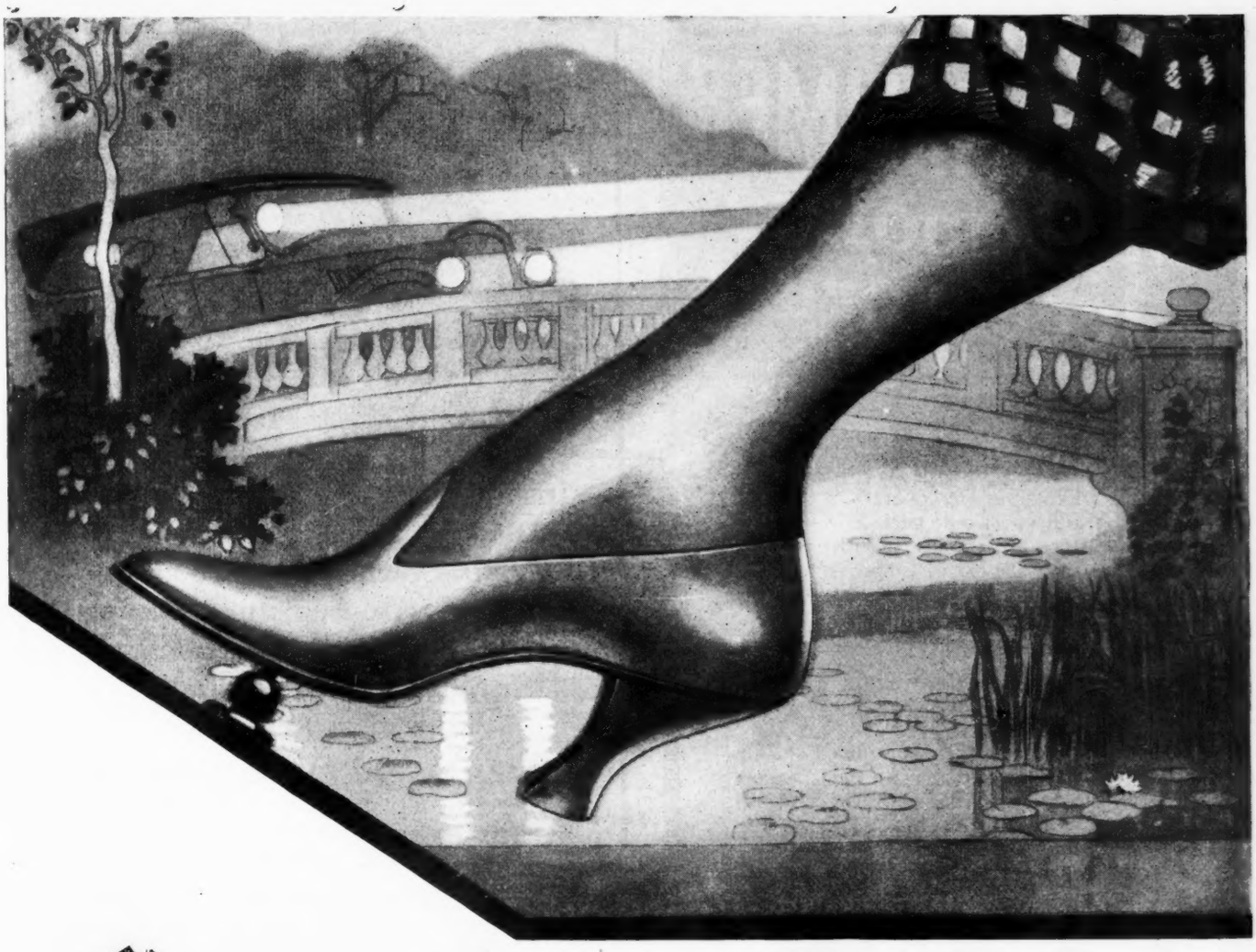


A Specialty for 76 Years

You are not surprised at the uniformly high quality of EMPIRE Bolts and Nuts when you know the character of the house that produces them.

Three plants—at Port Chester, at Pemberwick and at Rock Falls—are busily engaged supplying the needs of the world's biggest industries; a privilege won by 76 years of service.

RUSSELL, BURDSALL & WARD
BOLT & NUT COMPANY
PORT CHESTER, N.Y.
PEMBERWICK, CONN. CHICAGO · SAN FRANCISCO ROCK FALLS, ILL.
Makers of Bolts, Nuts and Rivets Since 1845



Auto-Lite

Starting, Lighting & Ignition

YOU *could not* motor without electrical ignition. You *prefer not* to motor without electric starting and lighting.

Yet, not many years ago ignition was experimental and electric starting and lighting were unknown.

Auto-Lite pioneered in the vigorous development which made these things *practical* for modern motoring efficiency and pleasure.

Thus in a few years Auto-Lite has wrought for itself the distinction of being the largest producer in the world of automobile Starting, Lighting and Ignition systems.

For an institution to attain such pre-eminence in its field bespeaks one thing above all others—Quality of Product.

This is emphatically brought home to a million and a half owners of cars equipped with Auto-Lite by the *invariable consistency* with which Auto-Lite functions.

Be sure your next car is Auto-Lite equipped.

OFFICE AND WORKS
TOLEDO, OHIO

ELECTRIC AUTO-LITE CORPORATION

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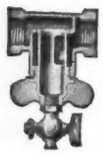
LUNKENHEIMER Automotive Accessories



Products of a superior grade—built for service. Economy in operation and consistent performance invariably result from the use of Lunkenheimer Equipment, establishing them as standard for dependability.

The proper selection of accessories is all-important and is the influencing factor in the success or failure of the power unit to which they are attached.

To standardize on Lunkenheimer Equipment is to obtain maximum service and satisfaction at minimum expense.

Distributers of Lunkenheimer Products situated in every commercial center.

Write for Automotive Accessories Catalog No. 5-HK.

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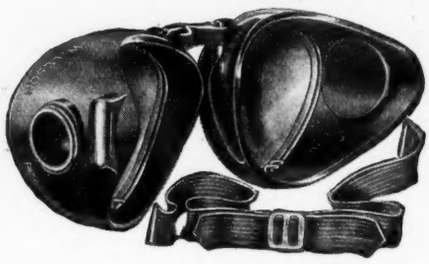

Some of its Properties

Infusible — High dielectric
Insoluble — Non-hygroscopic
Of great mechanical strength
Chemically inert
Resistant to moisture, steam, most acids and chemicals
Will not bloom or fade
Specific gravity 1.35

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We welcome inquiries from manufacturers, and maintain a research laboratory for the working out of new applications.

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ACKLIN-MADE stampings are economical because of the experience and facilities that stand behind them.

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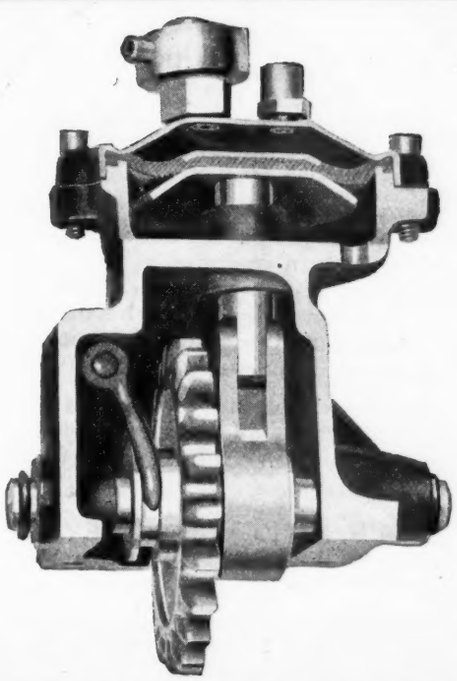

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Machines as readily as lead

VUL-COT Fibre comes in sheets, rods and tubes. It's dense and tough and has an extremely low friction co-efficient. This gives it the greatest wear resistance of any insulator.

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—And these are the properties that have made *VUL-COT* Fibre "The Material with a Million Uses." We have a book bearing this title. We'll send it: Tell us where. Also consult the *VUL-COT* Service Dept. in your individual problems.

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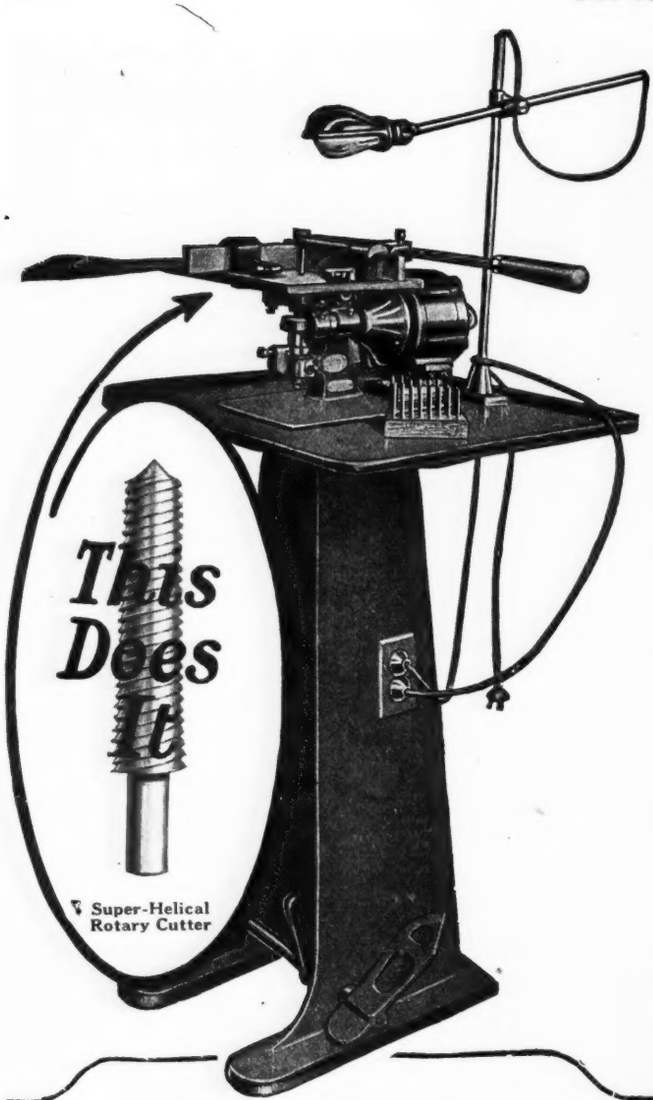

How quick and what will they cost?

Dies are ordered today and wanted yesterday! Who will wait upon obsolete filing machine methods? Who will pay for the puttering hours? The modern automotive shop is equipped for the keen competition of today—in it are one or more installations of Anderson Die Forming Machines.

For the fast production of irregular shaped blanking and drawing dies and templates; small sheet metal parts, formers for profiling machines; irregular shaped gauges; formers for cams; metal and small wood patterns and threading dies.

Its Super-Helical Rotary Cutter is constant cutting—removing stock as fast as the operator works.

Work is applied from any direction most convenient to the operator. It is drawn down upon the table by the rotary action of the cutter.

Tapered cutter insures uniform degree of clearness and a wide range of surface contours are finished without change of cutters.

Write for impressive list of automotive users and descriptive catalog.

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Bridgeport, Conn., U. S. A.

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Die Forming Machine and Super-Helical Rotary Cutters

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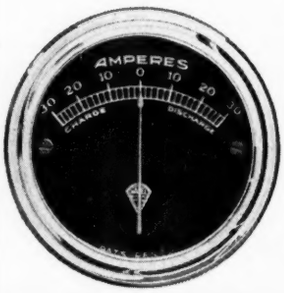
AN *occasional* glance at your Nagel warns you of battery or general trouble before serious damage is done, because the Nagel is on guard *constantly*. The accurate precision of its sensitive arrow indicator has won the confidence of more than 2,000,000 car owners.



The Nagel Ammeter is standard equipment on Austin, Auburn, Anderson, American, Beggs, Bell, Briscoe, Bour Davis, Chevrolet, Curtis, Collier, Handley-Knight, Haynes, Luverne, Maxwell, Mitchell, Moore, Oakland, Oldsmobile, Jackson, Overland, Pan, Peugeot, Piedmont, Security, Stanwood, Stephens, Studebaker, The Southern Six, Vogue and Willys-Knight passenger cars, and Atlas, Collier, Commerce, Denby, Gramm-Bernstein, Garford, G. M. C., Kerns Dughie, Nash, Nelson, Olds, Republic and Stewart motor trucks. Also endorsed by use by the makers of the Auto-Lite, Bijur, C. A. Vendervell, (London, Eng.) and Remy Starting and Lighting Systems.

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PRESSED STEEL PARTS

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To be sold at great sacrifice

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SATURDAY, JULY 9th, 10:30 A. M.

APPRAISED VALUES

Plant No. 1:		
Buildings	$104,450.11	
Machinery & Equipment	37,033.91	
Land	28,500.00	
Total		$169,984.02
Plant No. 2:		
Buildings	$304,444.71	
Machinery & Equipment	67,454.08	
Land	18,400.00	
Railroad Siding	2,376.00	
Total		$392,674.79
Construction Material		22,363.68
Stock & Supplies		270,476.37
Grand Total		$855,498.86

Plant is fully equipped for manufacturing bodies with large supply of lumber and aluminum sheets on hand.

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Drivers of cars appreciate the superior free-air service you can render with the Curtis Air Compressor. They know Curtis Air—clean, pure and FREE FROM OIL—preserves tubes and increases tire mileage.

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The number of Curtis Compressors in use today is unquestionable evidence of their distinct superiority. The Curtis, with its exclusive, patented, controlled splash-oiling system, is the only compressor so designed to prevent oil from being forced into the air line.

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There is a style Curtis Outfit to meet your particular needs. Ask your jobber for full information, or write us.

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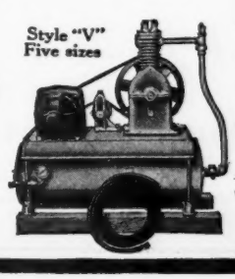

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Branch Office:
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Oakite Replaces Gasoline for Cleaning Auto Parts—and Speeds Up Work

This Advertisement is one of a series based on actual occurrences.

AN auto factory now uses Oakite materials (O.P.C.) for removing mineral oil used as rust preventive from steel fenders, hoods and bodies, because of superior results.

Formerly washed each part separately with gasoline, then sandpapered. This method cleaned the parts but consumed much time.

Now handle a number of pieces at the same time—boiling them for 3 minutes in tank filled with O.P.C. solution—then rinse and wipe dry.

Parts are put through in a fraction of former time—at less expense—fire menace is avoided — and work is 100% clean.

Write for free booklet 878—**Oakite Service for Automobile and Aeroplane Manufacturers.**

OAKITE

MANUFACTURED BY
OAKLEY CHEMICAL CO.
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Side Guide & Grinder

"THE WORKING MAN'S FRIEND"

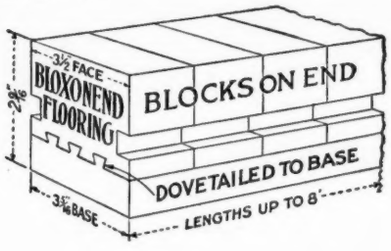
Blox-on-end in Nash Motors Co. Machine Shop, Kenosha, Wis.

In designing their new plant at Kenosha, Wis., the Nash Motors Company recognized that personal comfort is a powerful factor in raising the morale and efficiency of the employee. Their engineers demanded good floors—floors that would withstand hard wear indefinitely yet stay smooth—floors easy to truck over and easy on the feet of employees.

Blox-on-End Was Installed

Has it met their requirements? The caption tells the story. "Blox-on-end Flooring is the working man's friend" is not a coined phrase but a positive statement made by a workman to a party of industrial engineers who a few weeks ago visited the Nash Plant.

Blox-on-end will probably solve your flooring problems. Write today for Booklet "H". It contains valuable information concerning this ideal heavy service flooring.



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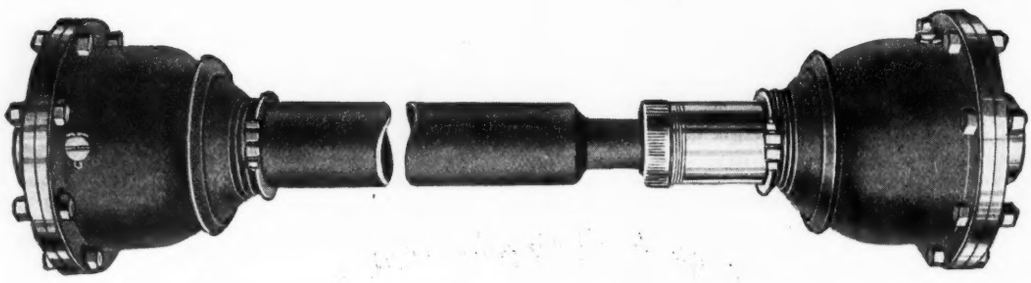

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If there is any doubt in your mind as to whether the thrust bearings now used in the products of your plant are best suited to the exact requirements—in design—in cost—in quality—come to Bantam.

Our engineering department is headed by a nationally known expert on thrust bearings—put your problems up to him.

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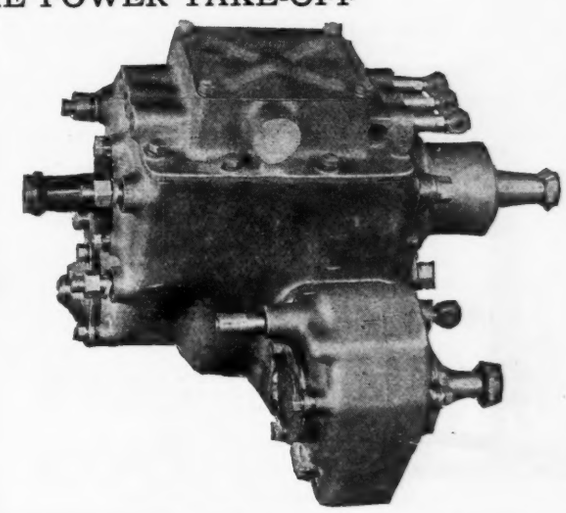
WITH OR WITHOUT THE POWER TAKE-OFF

Wherever a Fuller Transmission is doing double duty, i. e., loading or unloading a truck with the aid of the Fuller Power Take-Off, there are interested spectators. We cannot very well be jealous of the glances that invariably take in, first, the name of the truck, and then the name painted on the body or cab. Fuller Transmissions are silent salesmen for the triple alliance.



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Broaches That Cut Metals and Costs
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Every broach guaranteed.
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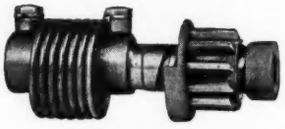
for ELECTRIC STARTERS

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194 Motor Car and Truck Builders Use It
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Send for the Manley Catalog. It shows other labor-saving equipment needed in every garage.
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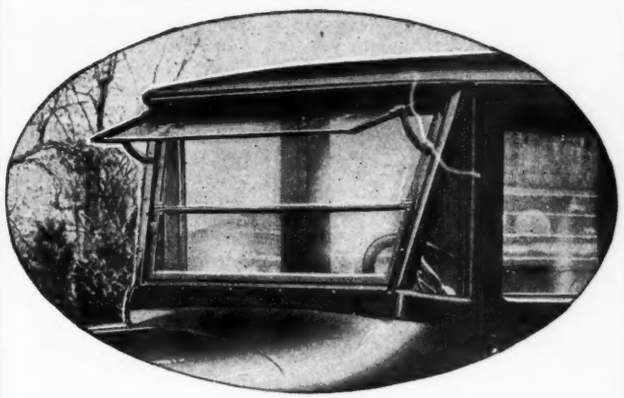

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The most practical flat glass for closed cars or body fittings. It is lower priced than plate glass and is just as serviceable.

It can be furnished in thicknesses not exceeding 3/16".

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Send us your specifications and let us show you how well we can serve you.

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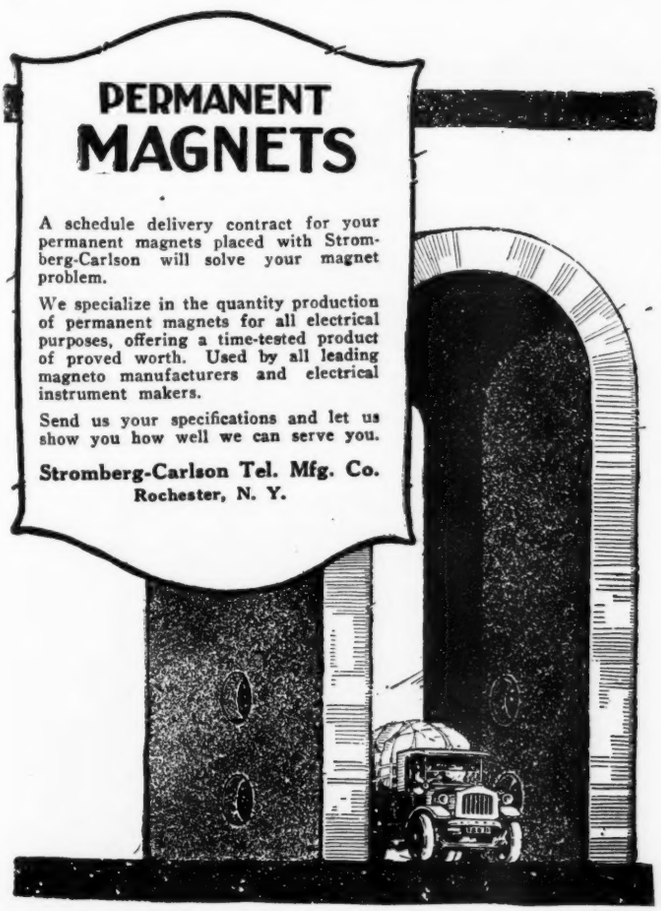

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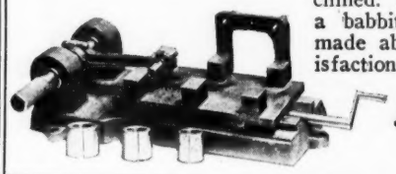

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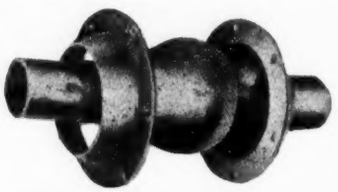
AUTOMOTIVE RADIATORS

Turn to Bossert for the Quick and Economical Production of Your Pressed Metal Parts



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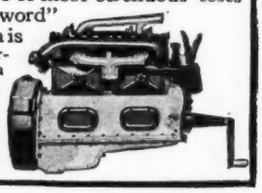

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Waukesha Motor Co.
Waukesha, Wis.

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SUPREME MOTORS CORPORATION
PEAK OF POWER
ENGINES
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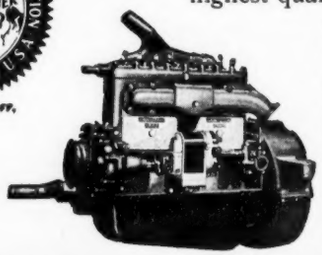
The Supreme Eagle-Seal

is our guarantee of the highest quality engine, produced on a large scale production basis by experienced engine builders.



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Warren, Ohio

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"PEAK OF POWER"

More than a Million a Month

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The Piston Ring Company
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Nearly all micrometers show an appreciable error at some points within their range. Pratt & Whitney Mikechecks offer an inexpensive, positive means for checking these errors. Set consists of gages .1", .2", .3", .5", and 1" in length accurate within .000025"—a quarter of a ten thousandths. Packed in gun metal case they fit the vest pocket. Their price is so low that every toolmaker can afford a set. Also furnished in metric sets from 2.5 to 25 mm and for larger work in 2" and 50 mm sizes.

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We supply great quantities
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Specialists in Alloy Steels
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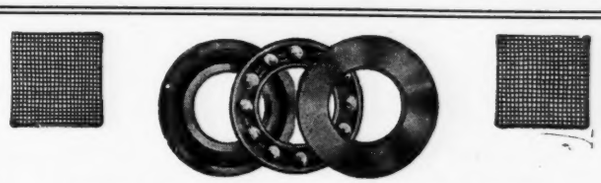

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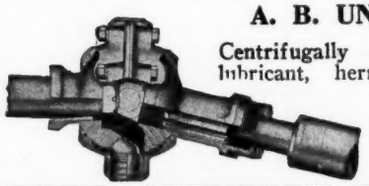

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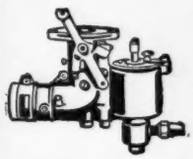

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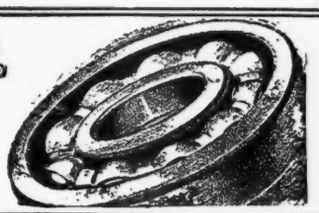

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Gray Iron and Semi-Steel Metals of Highest Quality

Modern Production Plant

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FLANGE, JOINT, HAND AND MANHOLE

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HUB CAP AND SPARK PLUG WRENCHES; SPECIAL SOCKET AND FLAT WRENCHES; METAL STAMPINGS OF ALL KINDS.

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American and foreign Patents secured. Searches made to determine patentability and validity. Patent suits conducted. Pamphlet of instructions sent upon request. McGill Building, WASHINGTON, D. C.

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70,000 STANDARD NO. 000 RUSTPROOFED

GREASE CUPS

AT AN ATTRACTIVE PRICE

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SERVICE MANAGER WANTED

Permanent position for energetic, efficient, practical man with considerable mechanical experience, also executive ability. Opportunity for clean cut, hustling young man.

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GEAR WORK OUR SPECIALTY

No job too big for us to handle or too small for our consideration.

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Many factories have odd lots of parts of various kinds resulting from discontinued lines. Why not sell to advantage through the Clearing House of The Automotive Industries?

WANTED

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A QUICK TURNOVER — MANUFACTURERS!

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No lot too small or too big to clear up. Send us a list of your odds and ends, and without in any way obligating you we will submit a specimen Clearing House advertisement along with advertising rates.

For a QUICK TURNOVER Address CLEARING HOUSE DEPT.

THE CLASS JOURNAL CO., 239 West 39th Street, New York City

Manufacturing and Merchandising Opportunities

A SPECIAL SERVICE TO OUR ADVERTISERS

The items appearing in these columns form a part of the inquiries received by our Contract Work Service Department during the past three weeks. Manufacturers or concerns interested in these or similar inquiries can secure full information as to how this service is operated by communicating with the Contract Work Service Department, Automotive Industries, 239 W. 39th Street, New York.

6880 Will consider taking over on royalty basis any patented device that might be readily manufactured from drop forgings or stampings; that is, we seek an opportunity to cultivate opening for useful devices which we could manufacture in our own plant and market under our own name.

6881 Designer wishes to interest manufacturers in making and marketing high pressure grease gun for chassis lubrication, preferably on basis of initial payment plus piece royalty.

6882. Has patented an auto-theft signal with which it is claimed practical and satisfactory tests have been made. The idea offers a signal by a whistle arrangement. Will dispose of patent on a royalty basis or consider other manufacturing and marketing arrangements.

6883 Has invented and applied for patent on an auto tire chain tightener. Would like to sell the manufacturing and sale rights on a royalty basis or will consider other mutually interesting plans.

6884 Has secured patent on a rear hub attachment for Ford cars. Can be used as temporary repair in case of broken hub, also will pull car out of mud when stuck. Will retail from $2 to $3 each. Manufacturing and marketing cooperation is desired or will consider royalty basis arrangement.

6885 This inventor has patented a device said to be a carburetor improvement which will prove economical to gasoline, also motor, resulting from the operation of the needle valve. Will sell patent on a royalty basis or will consider other arrangements.

6886 Has patented an auto tire and desires to have some special shape rims made. At this time only a few rims are wanted to make practical tests, although would be interested also in prices in quantities.

6887 Has developed and is already selling a high presure hand auto tire pump which can be easily and quickly attached and detached by clamping on running board and operated with easy back and forth stroke of the lever. Have sold foreign selling rights. Would like to sell domestic rights on a royalty basis or will consider a manufacturing and marketing proposition.

6888 Has invented an appliance which consists of a shoe, which can be readily clamped on the power wheel of an auto to prevent the wheel from slipping in the mud, slush, sand or may be used in any way where the wheel does not obtain a firm hold. It will in no way injure tire. Can be put on the market at a very reasonable cost. Would like to have device merchandised either on a royalty or contract basis.

6889 Invented and is selling a ray director. The device has been on the market for more than a year, now selling over a thousand pair per month in the city of Los Angeles, the device having been approved by the State of California as giving the best of satisfaction. Cheap to manufacture, retails at $2.50 per pair. Desire to market in a bigger way and therefore seek marketing cooperation, royalty basis preferred.

6890 Has patent since February 1921 on a bushing extractor and inserter. This tool can be manufactured as a special tool for autos and eliminates the dissembling and assembling of motors. Manufacturing and marketing cooperation wanted, or will consider royalty basis arrangement.

6891 Has patented an auto locking device which is a combination of a steering post and electrical lock which is placed on steering column. It is a key lock. When car is locked, there is no current. In other words, when steering post is locked you cannot start engine and car must be locked in order to shut down engine. Manufacturing and marketing cooperation desired or will consider a royalty basis proposition.

6892 This factor has been allowed patent on a tractor plow hitch device. This hitching device will automatically unhitch when the plow strikes a rock, stump, etc. Would like to have manufactured on a royalty basis or will consider any sound proposition.

6893 A company now making a nationally used small tool will buy outright, or manufacturing and selling rights of improved small tools or machinery equipment that would fit in with their lines.

6895 Would like to get production cost estimate on a thousand radiators. Five hundred for Buick cars and five hundred for Ford cars. Interested also in obtaining an estimate on cost of two thousand radiators, that is, one thousand of each for the two respective cars mentioned.

6896 Manufacturing concern with ample capital and very complete facilities for producing all sorts of small forged, hardened, heat treated, machined and ground articles, would like to be put in touch with parties having meritorious devices that could be sold in large quantities to the automobile trade, with view to purchase of rights or manufacturing under royalty basis.

6897 An established manufacturer of high class inner tubes wishes a number of additional salesmen to work on commission. Much desirable territory is open.

6898 Invented March 15, 1921, a boltless adjustable self locking hose clamp, which eliminates rusty bolts and torn bolt heads. Easily adjusted, and quickly applied. Would like to let out on a royalty basis with some manufacturer or would consider a contract basis proposition.

6899 A company located in Indianapolis is interested in receiving quotations on windshields, tops, upholstered cushions, and general body hardware and accessories.

6900 A foreign manufacturer would like to get in touch with someone who will cooperate in the manufacturing and marketing of a patented automatic traffic warner, to be manufactured and distributed under a royalty basis. The warning signal which is placed on rear of car and works automatically, has found considerable favor in England, therefore the desire to get device under way also in U. S.

6901 Has made a Hinge Radiator Cap that can be made to use on any car. This cap screws into the radiator the first time the same as any cap but after that all that is necessary to fill the radiator is to lift the lid or cover. The cap being fastened shut by a spring lock will prevent any leaking or rattle. No springs or small parts exposed to the action of the water to rust, will not burn the fingers. Would like to get in touch with some reliable firm who will make the caps on a royalty basis or will consider any sound proposition.

6902 Has devised and obtained patent on a device which offers methods and means for analyzing gaseous mixtures. The device can be located on the dash so as to indicate to the driver directly whether his mixture is too rich or too lean so that he may adjust his carburetor to obtain the maximum combustion efficiency from his gasoline. Would like to have patent taken over on a royalty basis or otherwise.

6903 A concern manufacturing a high grade puncture and blow-out proof armored inner tire, desires to get in touch with someone who has an established sales organization to dispose of a part or all of their output. A proven product recommended by thousands of users.

6904 An auto traffic signal company located in Missouri would like to get in touch with a manufacturer who will make and market their product.

6905 Vaporizing Process—world rights for sale. Patented in over thirty countries. A successful method of using heavy oils for internal combustion. Suitable for all types of engines. Principals only who command large capital or control first-class distributing facilities.

6906 Want finances to start manufacturing on a large scale a well developed and operating electric truck (Have 60 now in operation) or will lease patent on a royalty basis to a well established truck manufacturer. One of most efficient and simple electric drives on market to-day.

6907 Seek prices on 10,000 special class hydrometer syringe tubes which are very similar to the regular tube except that the lower portion is elliptical instead of circular in cross section, also 10,000 hydrometers with flattened bulb to fit above tube, and prices on 20,000 special springs formed from flat spring steel. Blue print and specifications available.

6908 Manufacturing and marketing facilities available for iron and steel products. Company prepared to finance desirable proposition. Prefer staple product past development stage.

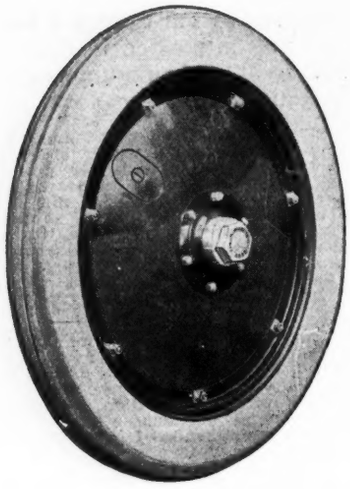
6909 Would like to get in touch with somebody near New York who is in a position to machine an aluminum piston in quantity lots.

6910 This company is interested in a high grade four-speed transmission with the fourth speed over-geared; transmission is to be used on a high efficiency, 4-cyl. motor car, which is being designed. Either amidship or unit power plant type of mounting. Also interested in four-wheel brake for autos. Desire to get in touch with a company building an axle equipment having brakes on the front as well as rear. Four-wheel brakes will require a special arrangement for the operation of the brake by the foot pedal.

6911 Manufacturing a combination auto lock as a preventive against auto stealing. Have sold several hundred locks which have given entire satisfaction. Wish to get in touch with a firm or individual who can assist in manufacturing and marketing. Will also consider a royalty basis proposition.

6912 Large manufacturers having stores and service stations from coast to coast, serving portion of the Automotive Industry, desires to add the representation of some salable article in same line—one well known or to develop some new device.

HARVEY



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LIGHTNESS

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RESILIENCY

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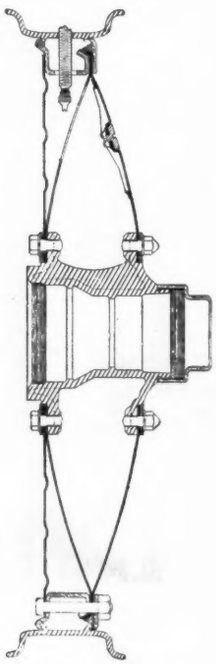

Hubs to Fit Any Axle

Tread Is Maintained

Air Valve Is Accessible from Front of Wheel

Triple Curved Discs of Steel Only Found in Harvey's

HARVEY RIM & WHEEL CO., INC.

BUFFALO, N. Y.

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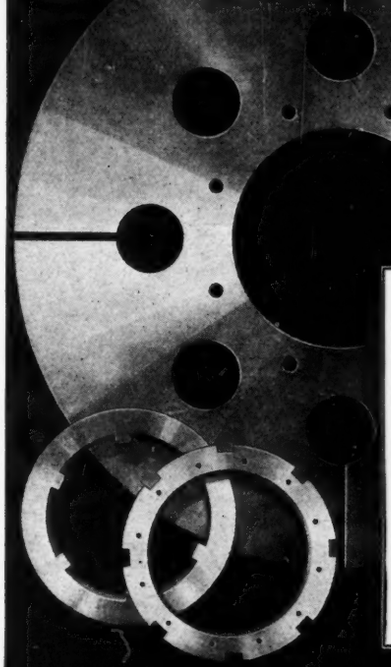
CURTIS CLUTCH DISCS



CURTIS Steel Clutch Discs are furnished in high carbon or soft steel, plain or slotted, flat or formed, unfinished or ground and polished, tempered or untempered—any size.

WE are experts in the manufacture of custom-built clutch discs of precision. We know exactly what is necessary to satisfactory performance in automobile, truck or tractor service.

By concentrated effort and intensive skill we have over a period of years developed the clutch disc business to a plane not approached by any other manufacturer.

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1649 Kienlen Ave. St. Louis, Mo.

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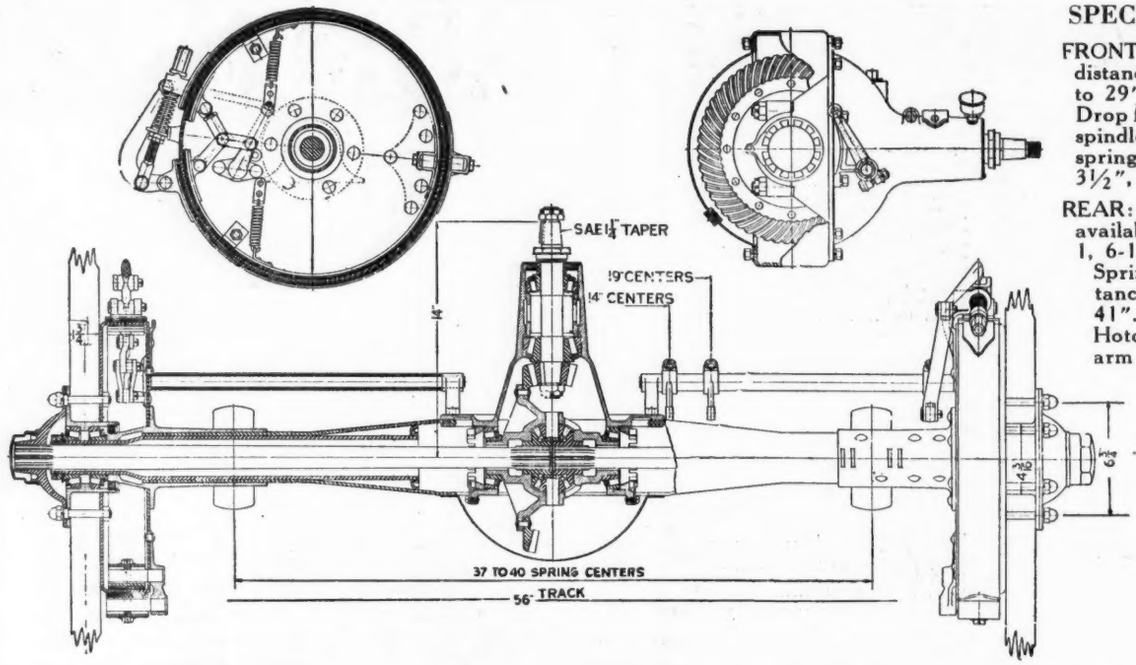

SPECIFICATIONS

FRONT: Spring center distance from 26½" to 29".
Drop from center line spindle to top of spring pad: 2½", 3½", 4½".

REAR: Gear ratios available: 5-1, 5½-1, 6-1, 6½-1, 7-1.
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This is why Columbia Single Reduction Axles resist great strains

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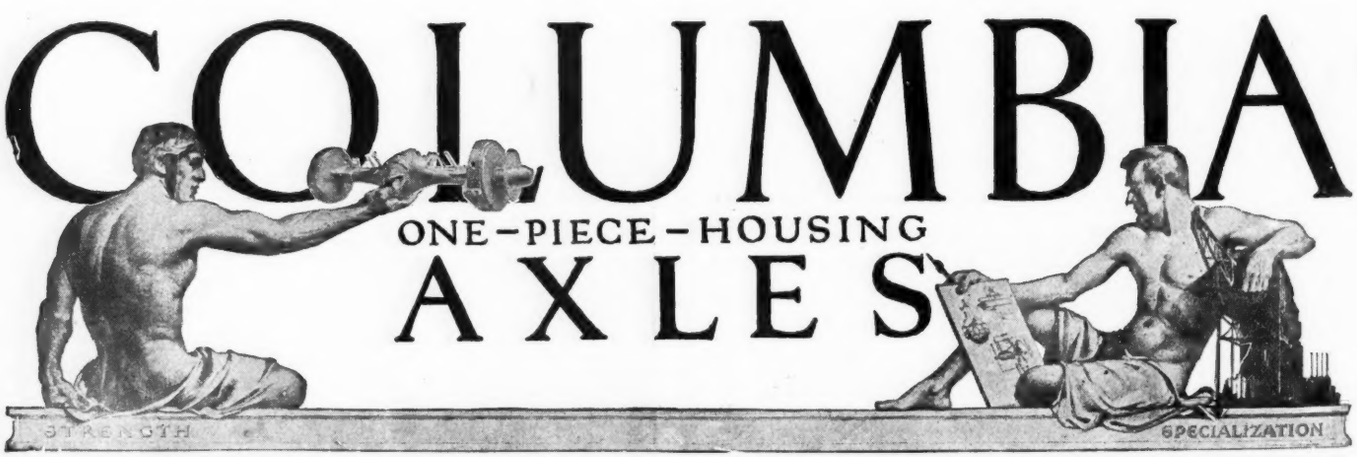
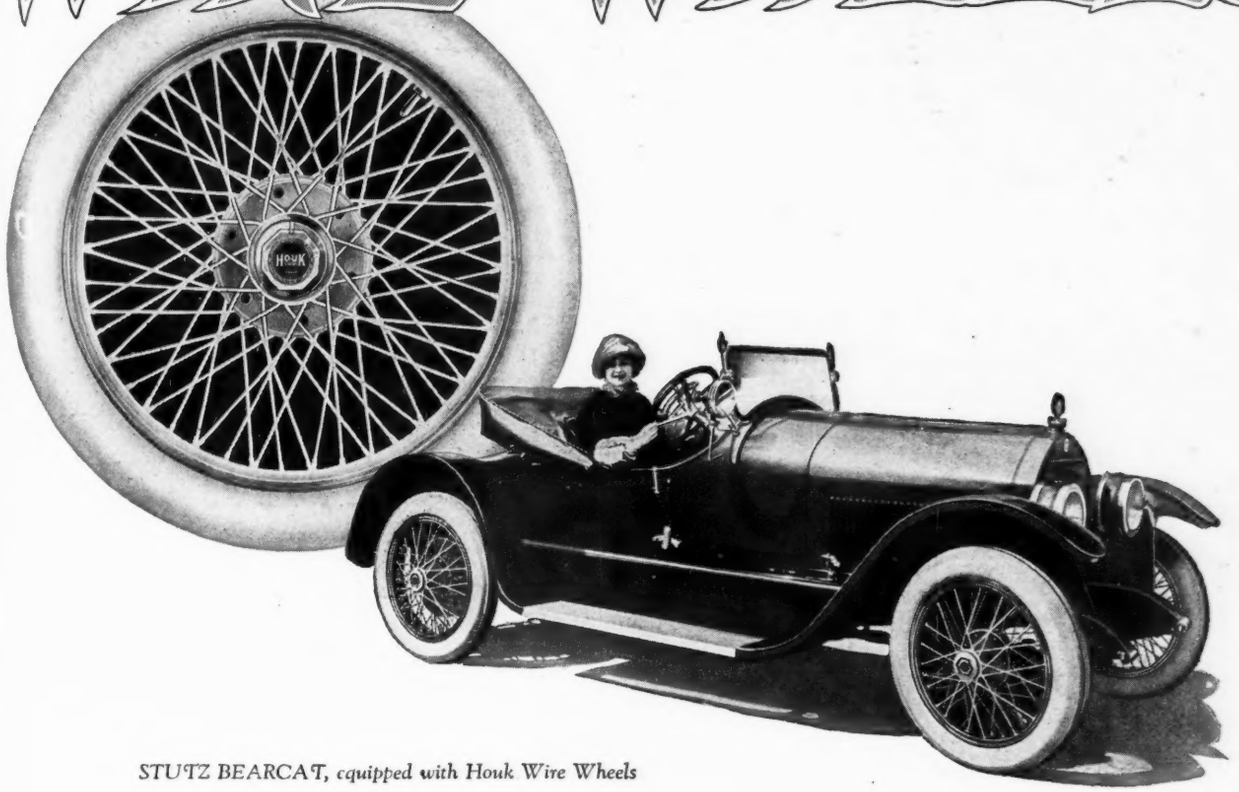


WIRE WHEELS



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for beauty, for strength, for quick changing, for every quality you look for in motor car wheels–

HOUK QUICK CHANGE

For over 600 models of 150 makes of cars. Specify make, model and year of car when writing for particulars.

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For FORD, CHEVROLET 490 and OVERLAND Model 4. Finished in White, Black, Red, and Cream—color optional.

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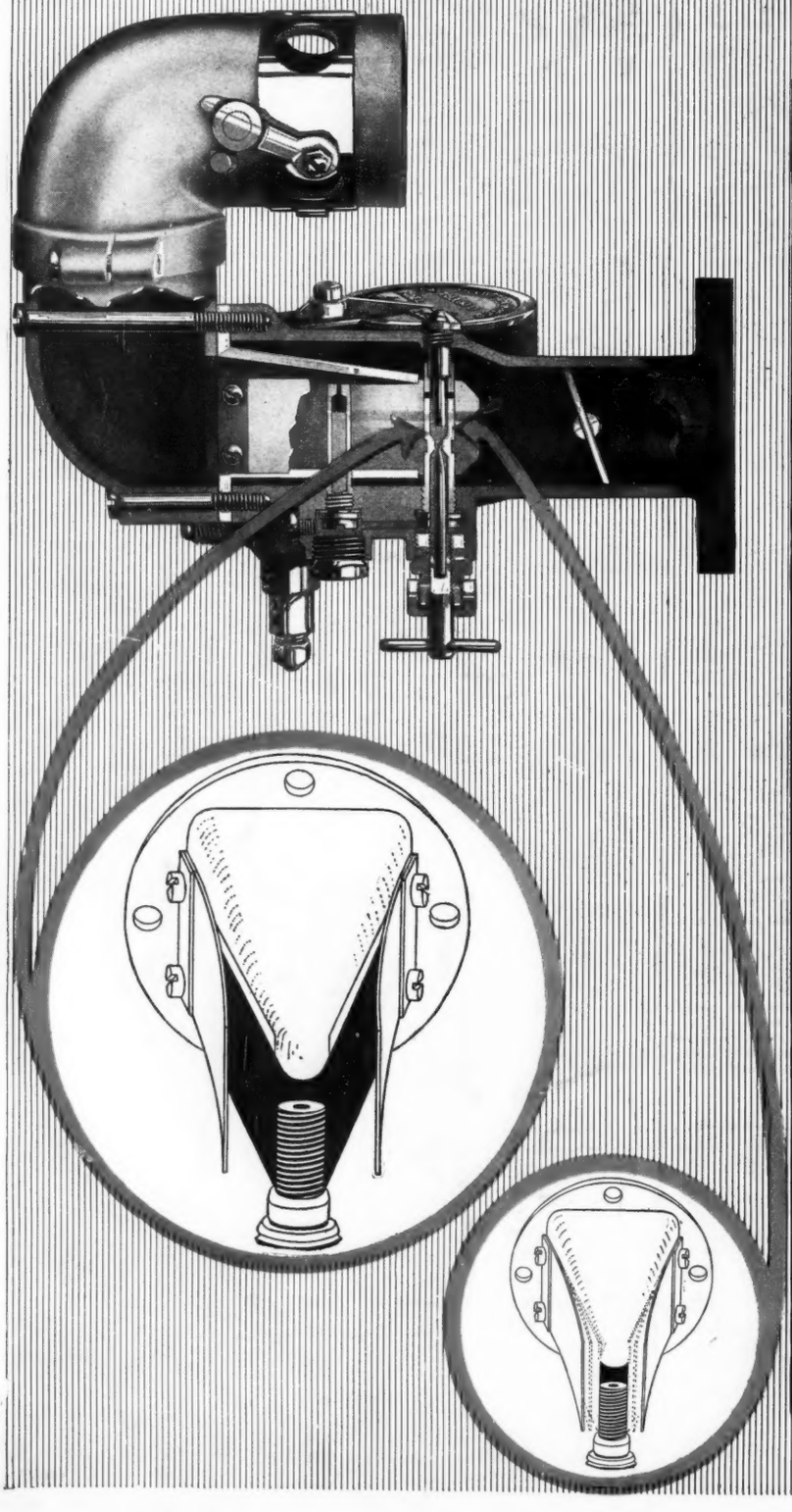
Tillotson
CARBURETOR



Automatic Air Valve

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